The Engineering and Mining Journal

VOL. LXXXII. NEW YORK, AUGUST 4, 1906. NO. 5.

Published Weekly at
505 PEARL STREET, NEW YORK
London Office: 20 Bucklersbury, London E. C., Eng.
Cable Address "Engminjour, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Canada, Mexico, Cuba, Porto Rico, Hawaii or the Philippines.

To Foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

Copies are on sale at the news-stands of the following hotels:—Waldorf-Astoria, New York; Brown Palace, Denver; and the leading hotels in the principal cities.

Copyright, 1906, by
The Engineering and Mining Journal.

Entered at New York Post Office as mail matter of the second class.

During 1905 The Engineering & Mining Journal *printed and circulated* 454,250 *copies, an average of* 8735 *per issue. Of this issue* 12,000 *copies are printed. None sent regularly free. No back numbers beyond current year.*

The Use of Pyrometers in Ore-Roasting.

BY WILLIAM E. GREENAWALT.*

Attempts have frequently been made to get uniformity in the quality of gold ore, roasted for treatment by the chemical processes, by establishing a system of absolute temperatures in certain parts of the furnace, and firing so as to keep those temperatures constant. On theoretical grounds this appears feasible. The difficulty lies in assuming that the ore fed into the furnace is of uniform quality, and that the other essential factors, such as air supply, always remain the same. Ore which is well bedded, and containing about 2.5 per cent. sulphur, may vary as much as 0.25 to 0.50 per cent. in 24 hours. The conditions which would be ideal for ore having 2.25 per cent. sulphur would be far from ideal for ore having 2.50 or 2.75 per cent.

Much also depends on the physical and chemical composition of the ore. The condition of temperature which would give the best results for partly oxidized ore would not give satisfactory results with ore containing the same amount of sulphur, from the deeper workings of the same mine, in which no oxidation had taken place, assuming, of course that the amount of ore roasted remains the same. When ore contains an excessive amount of dust, it cannot be roasted at the same rate and at the same temperature as ore which contains only the normal quantity.

The temperature of a roasting furnace appears to be very much hotter at night than during the day. Inexperienced roastermen are frequently misled by this. In such cases pyrometers are of great service in establishing absolute temperatures. They are also of great service in determining the temperature beyond which it is unsafe to roast. Experience and skill in the appearance of the ore as it progresses through the furnace, and its appearance after roasting, however, are the best general guides to obtaining uniform results. It is questionable whether, even with a perfect system of pyrometry, the experience and the skill of the operator will not always remain the dominant factor.

It is a curious fact that when roasting furnaces are overheated, the amount of sulphur in the roasted ore is abnormally high. One of the dangers in employing new roastermen is, that in their anxiety to get a good roast, they invariably fire at too high a temperature, with the result, that the roasted ore contains an unusually large amount of sulphur, and is in the worst possible condition for treatment by a solvent process. Pyrometers, in such cases are invaluable, as a warning to the roasterman when the safe limit of temperature is being exceeded. Frequent pyrometric determinations are absolutely essential to intelligent work, but they must be supplemented by experience and skill, and not dominate them.

Of the pyrometers in general use, those of the Le Chatelier type will be found the most satisfactory in roasting work. If the thermo-electric couple is protected, it may be inserted into the furnace and kept there a very long time—in fact more or less permanently—without appreciable injury. The limit of temperatures at which it is safe to use these pyrometers is a little below the melting point of platinum, which is about 3250 deg. F., although readings above 3000 deg. F. cannot be relied upon as perfectly accurate. In roasting work these temperatures are never approached. It is rarely that 1700 deg. F. will be exceeded. From 1400 to 1600 is the usual range in the hottest part of the furnace, for the various ores. Frequently ores are found which give the best results at as low a temperature as 1200 deg. F. It will be seen, therefore, that the only danger of injury to the thermo-electric couple of the pyrometer is from the furnace gasses. Even this danger is remote in any case, and is entirely obviated if the thermo-electric couple be protected.

Several pyrometers inserted at various points of a large roasting furnace will give invaluable information as to the limits of temperature, which, for any particular ore, will give the best extraction. Once these extreme limits have been determined, it is an easy matter to fire the furnace so that they shall not be exceeded.

While the determination of the absolute temperatures in roasting is not essential, nevertheless it is highly desirable. One of the gratifying features of the Le Chatelier type of pyrometer is that the absolute temperatures may be determined with greater facility and accuracy than the relative temperatures may be determined by other means, and absolute temperatures are always reliable for comparison.

*Engineer and metallurgist, Denver, Colo.

Lode-Lights.

BY E. HIBBERD.*

An interesting confirmation of the phenomenon ascribed to lodes and known to the old Cornish miners as "lode-lights" is given by an old Kirghese tradition regarding a hill on the property of the Spassky Copper Mine, Ltd. This hill is situated at the Yuspenssky mine, and its Kirghese name freely translated means "Sacred Hill." The tradition is that formerly, before the mine was worked, lights were seen on the hill at night and so the hill came to be regarded by the Kirghese (who are Mahometans) as a holy place and people suffering from illness were taken there to sleep at night to effect a cure. When the mine was found and worked by the Russians the lights disappeared.

This "Sacred Hill" is near the eastern extremity of a large body of high-grade copper ore, and is mainly composed of quartz and barite carrying a small percentage of copper carbonates.

Dr. C. Le Neve Foster, in his book "Ore and Stone Mining" states, as a possible explanation, that the phosphates usually present in the upper parts of lodes may react on carboniferous matter and produce phosphoreted hydrogen which on reaching the surface is spontaneously ignited. At the Yuspenssky mine, the shales forming one wall of the orebody are carboniferous but so far no phosphates have been detected in the ore or gossan.

The tradition, held by a pastoral people ignorant of mining, of the presence of these lights appearing on a hill forming part of the outcrop of a valuable lode helps to confirm the old Cornish reports.

*Spassky Zavod, Akmolinsk, Siberia.

The pampas, or plains, of Argentina, are said to be so absolutely level that there is one railroad over them which extends for 175 miles without a curve, and might have been continued in the same direction for 30 miles farther.

Mining in Colombia.

BY HENRY G. GRANGER.

The Spaniards in the 16th, 17th and 18th centuries obtained a production of gold in Colombia, of which the records are so much at variance as to render impossible an accurate determination of the precise amount; but it was so nearly a billion dollars as to have made Colombia the peerless gold country of the world, until California put the United States into the front rank. The Spaniards' gold was practically all taken out by placer mining, and so thorough were their methods that all who see their old workings admit that without the modern hydraulic elevator or dredge they could not have made a cleaner sweep. The only placer gold to be found now in Colombia is in the mountain tops where water is either scarce or absent, in the tributaries to the Amazon where the cannabalistic habits of the Indians make prospecting unpleasant, and in occasional banks that would require modern pipe lines, often with inverted siphons, to feed the monitors. In the occasional little patches of gravel along the streams myriads of peons, men and women, wash enough to make a living, waiting for periods of drought to dry up the streams and enable them to make a strike by getting at the submerged gold; they frequently become independent by a few day's work. Many divers in the middle stretches of the Andagenda river are known to have washed out in *bateas* 12. oz. per day in a dry spell which occurred about 20 years ago. Surprisingly rich results have been obtained in other rivers of the Choco district, such as the San Juan, Condoto, Tamana, Atrato, Negua Certegui, Cabi, etc. In Antioquia, also, many of the rivers are exceedingly rich; along the Porce, Nechi and other tributaries to the Cauca and Magdalena, there is a region so abundant in gold that it has been called the treasure houseof South America.

The Spaniards built some crude wooden stamp mills, nearly the same as the steel-shod sticks in general use throughout Antioquia, Cauca and Tolima today. Owing to the difficulties of transportation only four small California stamp mills have thus far been erected, all the other quartz mines being fitted up with the wooden mills. The stem of these stamps weighs 125 lb.; the steel shoe is of the same weight. The crushing is done through 11-mesh screens, and sometimes no screens at all, the ore splashing over a board on to blankets, which are invariably used to save the gold.

At one mine near Manizales, I saw a man working a dolly in an earth mortar between his legs, where he and his predecessors had for many years taken out $10,000 net per year. The vein was only a couple of inches in width, but ran $2,000 per ton. The country rock was a peculiar schist of a talcose slate, with minute quartz laminations. The whole mountain in that vicinity apparently contains from $2.50 to $5 per ton, and several times that right adjoining the vein, which allowed profitable crushing of much of the gangue extracted to clear the lode.

The duty of the wooden stamp is from 400 to 600 lb. of ore per day, crushed to 11-mesh. Seldom more than 25 per cent. of the gold can be saved by such coarse crushing, although in some mines the tailings are concentrated in sluices or on buddles, and then the sulphurets are worked in arrastras. Nevertheless, scores of mines are in operation, while hundreds of workable prospects are untouched because of the running mills owning the only available water. The stamps are dropped by cam shafts, made of logs, with wooden cams driven in, and built into overshot water-wheels. With Pelton wheels and electric transmission, there are many mines in the country which could be run profitably; some of them could safely be equipped with 100 California stamps to one wooden stamp in use today.

PRESIDENT REYES.

Gold dredging has been attempted at various times and places: in Antioquia, in the Choco or the region watered by the Atrato and San Juan, and on the Pacific Coast. The results were in all cases simply demonstrations of the existence of gold and the inability to save it. Now that modern dredging practice has proved so successful in other countries, in ground of the same physical character, and since confidence is established as to the stability of peace in Colombia, arrangements are under way by four American and two British companies to develop actively gold dredging in Colombia on the most modern lines.

Silver is mined in Antioquia, the Cauca and Tolima. Coal and iron are mined for limited local use, but are found in such extensive deposits as to become important factors when transportation facilities are provided. The same may be said regarding copper, sulphur, lead, cinnabar, nitrates, asphalt, petroleum and other minerals.

The most important feature in Colombia at present is her wonderful emerald mines. The mining of these precious stones is a Government monopoly. Although found in various places near Bogotá they are mined only at Muzo, about three days' mule riding north from the capital. This is the world's most important source of the gems. In the past the *modus operandi* has been to make short leases to parties who paid the Government a royalty of 80 per cent. of the stones they found, and even so, the leases were very profitable.

The emeralds are found on a mountain side, the gem-bearing strata alternating with barren strata. Under short leases the only way a mine could be worked was by catching the rainfall in little reservoirs on the slope above, and as water was collected, at rare intervals, booming off the picked surface. As perfect emaralds are worth more than diamonds and the demand for the beautiful stones is constant, President Reyes has decided to modernize the mining. A constant and abundant supply of water will be brought from a distance of 15 miles and a monitor installed, with sluices and all the paraphernalia for preventing the loss of any stones. This change will affect the emerald industry as diamond mining was changed into a business by the hand of the late Cecil Rhodes, who, by the way, was the almost exact counterpart, physically, of President Reyes, and a strong resemblance is seen in the aims, methods and personal force of the two men. From her emeralds Colombia will derive a revenue which will enable her to carry out all the reforms planned by the President and his cabinet, the foremost of which is public instruction.

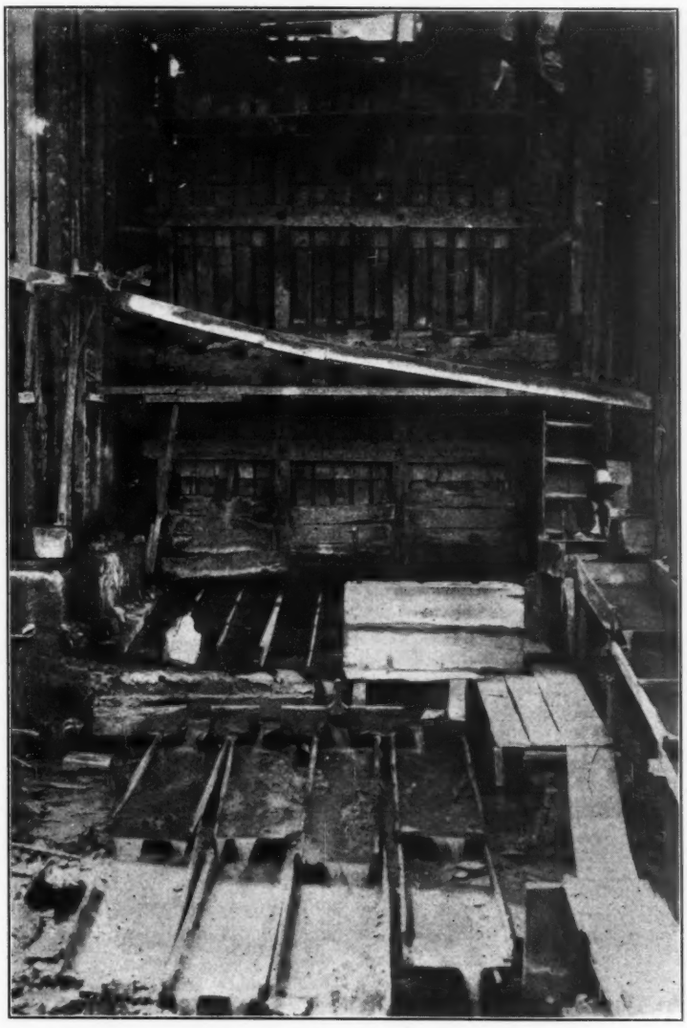
There are now engineering and technical schools at Bogotá and Medellin, and collegiate courses are given in the principal cities; but it is President Reyes' aim to have the common-school system as efficient as in Japan, where over 96 per cent. of the children of school age attend school. The policy of the Government is an eminently practical one—high protective tariff on all articles that can be produced in the country, and laws especially favorable to planters and miners; among these are free importation of machinery and light taxes.

One of the marvels to the traveler in Colombia is the arrival, after days of weary mule-back riding, at cities built in stone, with all modern conveniences, and a cultured society in residences that are eternal bowers of roses. The very comfort of the cities has been one of the country's draw-backs, as many of the wealthiest and most influential citizens have not cared to brave the discomforts of travel and exploration, and there have even been

presidents who, though accomplished men of the highest education, have never seen the Magdalena river. President Reyes, however, though second to none in mental qualifications, from his personal explorations, enterprises, and campaigns knows Colombia as no other man knows it. He has spent years in Europe, the United States and Mexico. When he finally yielded to the demands of the country and returned to take the presidency, his term beginning in August, 1904, he laid his policy in the two words "Paz y Progreso" (Peace and Progress), and is so living up to his program that he has inspired the confidence and cordial good will of all foreigners in Colombia, and the hearty support of all the leaders of the different political parties and factions.

One of General Reyes' strongest points is the development of transportation facilities. The army has been converted into organized road builders, as many of the mule trails had fallen into well-nigh impossible condition. Several railroads are being built from the coasts and from the navigable waters of the Magdalena to the interior. These roads will thoroughly open the mining regions and afford vastly improved facilities for the installation of machinery and modern processes in Antioquia and the Cauca.

Much has been written about the climate of the tropics as being unfit for the white man to live in. Generations of robust white families reside in the coast cities, and the health enjoyed by those of us who are veterans in the tropics is ample evidence on this score. Unbridled appetites kill more than the climate ever accomplished. Prudence, cleanliness, a sane bill of fare, reasonable precautions and some simple remedies, will keep anyone in good shape in the hottest sections, while at many points, especially in the higher altitudes, life is as pleasant as in Georgia in May.



A PRIMITIVE STAMP-MILL.

If metallic iron is melted along with copper or brass, part enters the alloy and becomes chemically combined, and the remainder separates in pellets or nodules of the hardness of steel. These nodules are the source of much trouble in brass, as they injure tools to an alarming extent.

A Unique Discovery at Cobalt.

BY J. J. BELL.*

New and valuable strikes of silver-cobalt veins are of frequent occurrence in the Cobalt district and probably the most important as well as the most unique discovery this season, has been made by W. J. Green, of Toronto. His engineer, Major J. R. Gordon, of Sudbury, after making a careful study of the formation of the district, concluded that a large vein was located under the waters of Clear lake, and to demonstrate this a diamond-drill plant was placed on a scow anchored in the lake and drilling for the vein was commenced. As a result one of the largest veins of the district was discovered.

The mining inspector examined the discoverey by reaming out the drill hole, showing 5 ft. of vein matter in crosscutting the vein, demonstrating native silver in large quantity and showing it to be one of the largest veins in the district. The drilling was continued by the inspector for several inches further, and when the core was brought up a large portion of it was found to be pure silver. It is needless to say the claim immediately passed inspection and patent was issued. The vein was found as extensive as anticipated and Mr. Green consequently purchased the property on the north side of the lake from W. R. Smyth, and set 40 men to work prospecting the property by trenches and test pits. The result has already demonstrated a network of veins, including an extension of the one found in the lake. The two properties will be operated together by the Clear Lake Mining Company, of Toronto, which has obtained an Ontario charter and will shortly be organized.

A Novel Repair Job.

BY REGINALD MEEKS.

A piece of repair work on a cast-iron edger frame was not only novel but effective. One of the housings was broken in a railroad wreck, and while apparently only fit for the scrap pile still it was decided to make an attempt to join the broken pieces by "burning" with molten iron. The fracture was adjusted and a dam of molding sand was built up around the break with a runaway leading to the pig-bed. When all was ready about 600 lb. of hot iron were poured through and around the break. When cool the casting was chipped and was found to be in satisfactory condition, and the metal seemed to be homogeneous.

The estate of the late George Lansell, the "quartz king" of Bendigo, Victoria, was valued for probate at £600,000.

*27 Prince Arthur Ave., Toronto, Ont.

Ore Shoots.

BY WALTER HARVEY WEED.

The localization of bonanza ore, or of pay ore, into ore shoots is a matter of vital importance to the mine operator, and any sound deductions that can be drawn and formulated into rules will have an immense practical value, even if the rules are only valid for the particular district studied. An excellent example, in which definite relations appear to exist, limiting pay ore in depth, has been observed in the Hauraki gold field of New Zealand,

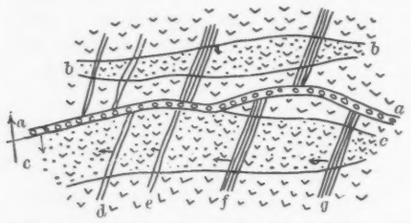


FIG. 1. PLAN OF NORTHERN PART OF THAMES GOLDFIELD (PARK).

Stippled area represents pay ore—*a a* Great Moanataire fault, *b b* Point Russell productive zone, *c c* Kuranui productive zone of altered andesite, *d* Shotover vein, *e* No. 9 vein, *f* Caledonia vein, *g* Waiotahi vein.

described by Park. The veins, which are payable in altered andesite and barren in tuff, all become enriched on entering a particular zone or belt of altered rock. There are several such productive zones, which are limited in extent vertically and horizontally, and yet (according to Park) are not the result of secondary enrichment.

Fig. 1 shows ground-plan sketch of the veins of the northern portion of the Thames (or Hauraki) goldfield, N. Z., the shaded area representing the productive zone. Four large parallel lodes cross a zone 600 ft. wide. Fig. 2 gives a vertical cross section through the veins, and shows that pay ore is confined to the Kuranui "productive zone." It should be noted,

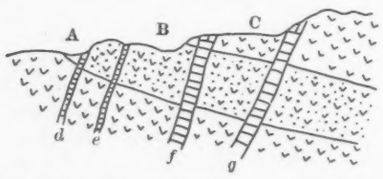


FIG. 2. VERTICAL SECTION ALONG NORTHERN FORESHORE, THAMES GOLDFIELD (PARK)

Stippled area represents pay ore—*a* Shotover creek, *b* Moanataire creek, *c* Waiotahi creek, *d* Shotover vein, *e* No. 9 vein, *f* Caledonia, *g* Waiotahi vein.

however, that in this zone the pay-ore shoots and bonanzas occurred in almost all cases at the intersection of a cross vein, a so called "flinty" or leader. In the Kuranui end of the field the shoots occur near the surface, but southward they are at increasing depths, reaching 1000 ft. below sea level in the Queen of Beauty shaft. This occurrence at intersections is apparently independent of depth, as, for example, at Guanajuato, Mexico, where the bonanza orebodies occur just beyond the intersections of hanging-wall veins and the mother lode (Veta Madre), as shown in Fig. 3.

More perplexing, because seemingly at variance with all precedent, is the behavior of the veins at Marysville, Montana. The rich ore shoots, in many places outcropping, did not extend to a depth of more than 900 ft. below the surface; in many mines much less than this. The ore shoot was not affected by change of country rock (diorite and altered shale), and the vein below was as wide and as solid and persistent as above, but was simply barren. In such a case great erosion has taken place since the formation of the orebodies, as shown by the topography, the geologic structure and the extensive placer field whose gold certainly came from these lodes. Thus the barren uppermost part of the vein (if the theory of vertical distribution of primary ores, advanced by me, and independently by Gregory, and supported by the observations of Jenney, be correct) has been removed. Probably a certain amount of secondary enrichment also took place during the degradation of the lode. The conditions observed in the Carmen-Pinguico vein, at Guanajuato, afford a good illustration of the correctness of this

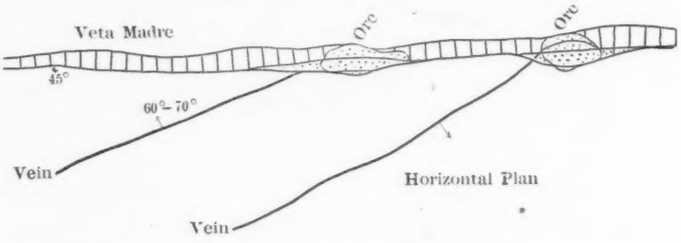


FIG. 3. THEORETICAL DIAGRAM TO SHOW OCCURRENCE OF BONANZA ORE SHOOTS AT GUANAJUATO, MEX., AND THEIR RELATION TO INTERSECTING VEINS.

theory, but space forbids a description here.

The veins of Hauraki, New Zealand, appear from the descriptions of Park to be of undoubted hot-spring origin.[1] "The great mushroom-capped veins of the Hauraki region and Great Barrier islands * * * are composed of sinters and chalcedonic quartz, manifestly the result of long-continued solfataric activity." These overhanging mushrooms of silica are almost devoid of gold and metallic sulphides, but the necks in all cases contain gold and sulphides of silver and iron. Had denudation removed the mushroom caps, the sulphide-bearing necks would now be exposed at the surface.

The well known Martha Lode at Waihi has no overhanging cap, but consists of chalcedonic quartz, apparently the result of hydrothermal activity, which at one time probably manifested itself at the surface. At the outcrop the "quartz" is almost pure silica, devoid of sulphides, except a trace of argentite and of free gold with one-third its weight of silver. Above water level the ore is clean and free from oxidized products. In many places, both above and below water level, joints in this veinstone are discolored by films of manganese and iron oxides, which owe their origin to the infiltration of meteoric water from the wall rock, and not the oxidation of contained sulphides. Between the adit level and No. 1 level there begin to appear small limonite-encrusted cavities in the thin veins of crystalline quartz which traverse the main lode. At No. 1 level there are detached bunches of iron pyrite in the quartz, and at No. 2 level the sulphide ore forms a rib 2 or 3 ft. thick. Down to the lowest working, 750 ft., there is an increase of sulphides and no decrease of value.

The Pinguico-Carmen vein, the enormously rich gold-silver vein at Guanajuato, shows in most places no quartz outcrop, only a barren fissure, with some rock decomposition, and this is probably why it escaped discovery and exploitation in the two and a half centuries of active mining carried on about it. This fissure when explored in Pinguico ground, carried no ore near the surface, but as exploration was carried farther down the fissure was found to hold a stiff mud, which with increasing depth became very rich in metallic sulphides. The mud appears to be the result of extreme hydrothermal alteration of the rhyolite wall rock. This material extends downward a few hundred feet, and gives way to a solid quartz vein equally rich in metallic sulphides. The lower limit of these ores may, from analogy with the adjacent veins, be expected to be found at considerable depths. The conditions are interpreted as indicating little erosion since vein formation. In veins of this class the depth to which pay ore will be found can be inferred from the extent of post-mineral erosion. If the country has been lowered by long-continued, vigorous erosion, not only the barren upper part and the mud-containing part of the vein will be worn away and carried down the gulches, but a considerable part of the quartz-filled veins may be carried off and only the roots of the vein remain. In such a case mining would disclose the lower limit of pay ore at a relatively shallow depth.

[1] James Park, *Australian Mining Standard*, Jan. 5, 1905, p. 10; *Trans.* New Zealand Inst. Min. Eng., Vol. I, 1897, p. 94.

Matte Converting.

BY HIRAM W. HIXON.*

The first successful experiments with the converter as applied to copper matte are credited to Pierre Manhès; but many attempts had previously been made, and patents issued. However, the experiments failed, because no provision was made for punching the tuyeres.

Manhès' invention consisted in placing a hole in the outer surface of the tuyere-box in alinement with the tuyeres, so that a rod (slightly smaller than the tuyere) could be driven through this hole into the tuyere, through the lining, and dislodge any obstruction at the tuyere end. In his patent specification, the word "air-belt" is used in place of tuyere-box; this gave the opportunity for placing the tuyere in a box separate from the air-belt (to avoid infringement of the letter if not of the principle of his patent), and was quickly utilized.

In 1892 I was engaged to build a converter plant for the Anaconda Copper Mining Company, and, on the advice of the company's attorney, the converters were constructed on the principle described above. I do not believe that the point was contested.

The holes through the outer surface of the tuyere-box were closed by wooden plugs (which had to be driven in tight enough to hold against the blast pressure of 10 to 15 lb. to the sq.in.). The matte thrown out of the converter during the blow, would ignite the outer ends of these plugs, and the heat would contract them; so that, between the pressure from within and the fire from without, it was like standing in front of a gatling gun to punch the tuyeres. A plug weighing 2 oz. and propelled by a pressure of 15 lb. could knock a man out completely; and adding to this the chances of having a shower of fluid matte fall on him, he certainly earned his $2.50 for a 12-hour shift.

Julius A. Dyblie (who was associated with me in designing the plant) changed all this, and invented the ball-valve which bears his name, and for which he receives a royalty from the manufacturers. These valves were so arranged that when the converter was in position to blow, each tuyere-hole in the outer surface of the tuyere-box was automatically closed by a steel ball slightly larger than the hole. Guides were so arranged that the punch rod would lift the ball away from its seat, and return it to its place when the rod was removed.

After the valves were introduced did not require such a reckless man, nor the two bushel of plugs daily that were previously required. Since that time other valves have been introduced which embody the same principle; such as the use of a small cylinder, in place of a ball-, a flap-, or clack-valve, hung loosely at the upper ends.

The Parrot Company in Butte, is said to have first used the converter on copper matte in America. The H. H. Vivian Company, operating the Murray mine near Sudbury, Ont., was the first to apply it to copper nickel matte. The Chicago mine (operated by R. P. Travers) also used a small converter on copper-nickel matte at a later date. This mine did not continue long in operation; the same is true of the Murray mine. Their converters were of the barrel type, and not much larger (probably 5 ft. long by 4 ft. diam.); they turned by a screw operated by hand or by a belt from a shaft.

In the converting of copper matte, the iron is all oxidized first, and, after the resulting slag has been poured off, the remaining high-grade matte is blown up to blister copper and poured into bar molds. This cannot be done with copper-nickel mattes, as the nickel begins to oxidize and remains in that condition after the iron is removed. It is therefore necessary to stop the process at this point and pour the matte into molds, when the iron has been reduced to 1 per cent. or less. For these reasons, all the converting plants which have operated on Sudbury ores, have produced only high-grade mattes carrying copper and nickel in varying proportions, depending on the metal contents of the ores from which they were derived. The sum of the two metals is, approximately, 80 per cent., with 18 per cent. sulphur, 1 per cent. iron, and 1 per cent. oxygen.

The Canadian Copper Company used converters in a small way at a later period than the H. H. Vivian Company; but it was claimed that the loss of nickel was excessive; and, on that account, that the process could not be successfully applied to ores carrying nickel.

The plant which I constructed for the Mond Nickel Company disproved this contention; and at a later date the Canadian Copper Company introduced the latest practice of large furnaces, and large converters electrically operated; it now has the largest and best equipped plant in Canada. The electric transmission (from the high falls of the Spanish river) to Copper Cliff is over 25 miles long, and has a capacity of 5000 h.p. The converting process is now producing nearly all the copper derived from sulphide ores, and all the copper and nickel from the Sudbury district.

The practice of converting is interesting, and varies considerably in different localities. The original practice at Anaconda and Butte was to line the converters with a mixture of crushed quartz, with enough clay to bond it. The lining was put in wet, and simply plastered together by pressure of the liner's hands, feet and knees, while standing in the converter. The top and bottom sections were lined in the same manner while together in the stand.

After the introduction of the traveling crane, three or more shells were provided for each stand; the vessels were taken out to be lined, the top section being removed, and the interior sprayed with water. After cutting out the slag shell, the new lining was tamped in between the old lining and a wood or steel form. The thickness of a new lining would depend upon the diameter of the vessel; in the largest sizes, it was about 30 in. at the tuyeres, and tapered off to nothing at the mouth. The mixture for tamping was not so wet as in the other method described, but otherwise it was the same. The top sections of converters may be tamped, but are generally lined by hand after being placed at the bottom section. A tamped lining frequently falls out when being turned over to put it in place. If the mixture is adhesive enough, it can be done; but the clay generally available will not stand such shocks, and the result of several hours' labor may be lost in placing the top on the bottom section.

At Tezuitlan, Mex., the Pachuca *lamas*, or clay ore from the silver mines, was used for lining material. This consisted of almost pure silicate of alumina, with 10 to 20 oz. of silver per ton, and was very adhesive. The tops were tamped the same as the bottom section. The joint was made of a special wet mixture of the same composition, placed on the bottom section; the top section was lowered down upon it by the traveling crane. Cutter bolts and keys drew the two sections firmly together, and the lining was ready to be dried out and heated before being placed in the blowing stand.

This drying out and heating is important and necessary to the success of the blowing. If a lining is wet and cold, the slag, if formed at all, will be too cold to separate from the matte; the result will be a granulated mixture which will have to be poured out and broken up. As the size of the interior is small on the first charge, it is necessary to have the lining next the charge red hot, although the heat may not penetrate more than 2 or 3 in.; and the remainder of the lining may be quite wet. The matte should also be quite hot; for, if cold, it will act slowly and may produce the same result as if charged into a cold vessel.

For this reason I prefer tapping direct from the settler into the converter; but nearly all plants use a ladle and traveling crane to transfer the charges from the settler to the converters; and in large plants it is necessary to do this on account of having one large furnace to supply several converters.

The use of silicious silver-, gold- or copper-ores for lining material is one of the most important features; it can be

*Manager, Mond Nickel Co., Ltd., Victoria Mines, Ont.

made a source of revenue (instead of an item of expense, as when barren quartz is used). The vessels should be large enough to get the greatest thickness of lining; and deep enough to permit the use of 15 lb. of blast without blowing the charge out of the mouth of the converter. The first use of silicious ores for lining was attempted at the Parrot in Butte; but the vessels were too small and the linings gave out too rapidly when made of material less refractory than quartz and clay; the practice was abandoned.

I introduced the use of Pachuca *lamas* at the Guggenheim Plant at Aguascalientes, Mex., in 1895; but men with the patent mania have been inventing it on an average every year since.

The shape of converters has been supposed to have a decided effect on the blast pressure required; the claim being made that the barrel type of converter could operate on 5 lb. pressure, where the upright or round type would require 10 to 15 lb. I have operated both types, and I fail to find any difference. The whole question hinges on the depth of matte over the tuyeres; and, as it is necessary to have the blast penetrate about 2 ft. or more of a bath (in order to give time for the combination of oxygen with the sulphur and iron), the shape of the vessel does not enter into the question. It is easier to move the barrel-type converters on and off their stands; the stands are much simpler and cost less (which is probably the reason for their greater popularity).

The life of a lining varies with several factors, and may be long or short, depending upon all or any one of them:

First, the grade of the matte is important. Matte high in copper will be low in iron, and *vice versa*; and, as the iron from the matte requires silica and gets it from the lining, the more iron a matte contains, the shorter will be the life of the lining, other things being equal.

Second, the composition of the material from which the lining is made affects its resisting or refractory power. A lining made of pure quartz, crushed fine and bonded with a fat refractory clay, would at first appear to be the best lining that could be made; but I have found that this is not so. A quartzite containing 87 per cent. silica and 10 per cent. alumina, bonded with the same clay as the quartz and converting the same grade of matte, gave a 50 per cent. result.

For example, the silica lining would last for an average of six charges on 27 per cent. matte; the quartzite lining would convert eight charges. As the last two charges contain as much matte as the first four the actual showing was rather better than 50 per cent.

Feeding silicious material into the converter while it is blowing has a beneficial effect on the life of the lining, as it supplies silica that would otherwise have to come out of the lining. The life of a lining can be increased 50 per cent. by additions of silicious material through the mouth of the converter while blowing, or by charging into the vessel before the matte. All such material should be thoroughly dried beforehand or serious explosions are likely to result.

In order to dry this material I have found it convenient and effective to charge into the downtake from the blast furnace, and draw it out of the flue as needed. The flue dust which is mixed with it does not interfere, as it is present only in small quantity. The lining should be compact enough to prevent the escape of too much blast through the lining without penetrating the charge, and at the same time porous enough to promote rapid drying and the escape of steam.

It has been found that a considerable portion of the blast enters the charge through small openings in the lining other than the tuyeres. When a converter is turned down, to pour off slag, these small capillary openings may be seen as small dark spots, showing against the incandescent interior. They are dark because colder than other parts of the interior, due to the chilling effect of the blast; but they quickly become red and disappear when the blast is shut off.

The chemistry of copper-matte converting, and the fact that metallic copper can be produced from copper sulphide, depend upon the reduction of the copper oxide by the sulphide. This takes place throughout the blow, and prevents the copper oxide from going into the slag in large quantity. In the latter portion of the blow (when all the iron has been removed and only copper sulphide remains), the reduction must keep pace with the oxidation, or a slag would be formed before the finish, which would be high in copper oxide.

The fact that this slag does not form until the charge is overblown proves that the reaction:

$$2\,CuO + CuS = 3\,Cu + SO_2,$$

takes place as rapidly as the copper oxide is formed.

If a charge is overblown slightly before pouring the slag, the large amount of slag will absorb the copper oxide more rapidly than the reduction takes place. The result is that when the converter is turned down, changing the equilibrium of the sulphides and oxides, foaming and shooting from the mouth of the converter result. Indeed, if the overblow has gone far enough, the entire contents of the converter may be thrown out by the sudden liberation of sulphur dioxide.

The reaction between nickel sulphide and nickel oxide does not take place as rapidly as in the case of copper. The result is that in the after-blow (when all the iron has been removed) the nickel begins to oxidize; this nickel oxide combines with silica to form a thick, pasty slag, which chills on the interior of the vessel and clogs the tuyeres, preventing the blast from entering. It is difficult to blow a charge of matte containing nickel after the iron has been eliminated; and it is impossible to finish a charge to metal in the same manner as with copper alone. The nickel will be oxidized before the sulphur is all out, and the resulting metal will not contain more than a fifth of the nickel that it should when there is still 5 per cent. of sulphur remaining. This accounts for the fact that all mattes containing nickel are converted only to remove the iron; the process is stopped when the metal content reaches 80 per cent.

William A. Heywood has described his success with a magnesite-lined converter at Butte. The remarkable results obtained on matte carrying as low as ten per cent. of copper constitute such a radical departure from all established practice that further developments are awaited with interest. The smelting of raw sulphides has always been handicapped by the production of large quantities of low-grade matte, which could not be converted in silica-lined converters, because of the too rapid destruction of the lining.

If, as seems probable, this matte can now be converted in converters lined with magnesite, all the necessary silica being fed in before or during the blow then the proper way to treat such ores is to smelt them raw, with the fuel necessary to make the furnace run at a good tonnage, and convert all the matte. This will avoid the necessity for the two-stage smelting practice, at present in use at many plants; and, at the same time, it will produce blast-furnace slags much lower in copper content than previously obtained.

While the magnesite lining has proved such a success on low-grade copper mattes, to my regret I found that on nickel mattes it did not operate as well as the silica lining. The chief difficulty was in getting the blast to enter. The tuyeres became clogged and needed continual punching. If allowed to run without punching, in less than a minute the blast would be shut off entirely. The lining was put in, in the manner described by Mr. Heywood, and all the conditions were as usual with a silica lining. We succeeded in finishing about one charge in four, the others being too cold to produce fluid slag. The blast pressure was raised from 10 to 18 lb. per sq.in., without effect.

I am of the opinion that the presence of silica at the tuyeres is necessary in the case of nickel matte, in order to combine with the small amount of nickel oxide formed; as otherwise, it chills and stops the tuyeres.

Mining at Tonopah.

BY CLAUDE T. RICE.

THE MIDWAY MINE.

Several of the men who had been in the Tonopah district almost from the discovery—in fact the discoverer, Jim Butler, among them—decided to sink through the later andesitic capping which outcrops at the surface and prospect the underlying earlier andesite for continuations of the veins which outcrop to the south, where the ore originally was discovered. Work

TONOPAH-MIDWAY SHAFT AND SURFACE PLANT.

was begun Oct. 23, 1902, on a shaft which is at present about 675 ft. deep. Ore was found at a depth of 500 ft. in an east and west vein which dips about 45 deg. to the south. Since then ore has been found in two other veins.

This south vein is from 4 to 8 ft. in width, and averages about $35 per ton, the ore running from $20 to $100 per ton so far as developed. The ore is oxidized, and is of milling character rather than a shipping ore. In the footwall of this vein, and about 75 ft. from it, another east and west vein was subsequently discovered. This vein is nearly vertical, but leans slightly to the north. The ore is a sulphide. It is upon this vein that the present value of the mine depends. The vein varies from 4 to 12 ft. in width, and is very rich. In some places it has averaged over $1000 per ton across a breast 12 ft. wide. For 60 ft. on the west side of the 435-ft. level it was from 6 to 12 ft. wide, and the ore averaged over $300 a ton as it was shot down in the stope.

About 150 ft. south of the sulphide vein on the 435-ft. level, another parallel vein, dipping steeply to the south, has been opened. The ore is about 2 ft. wide, and averages $75 per ton. The crosscut on the 435-ft. level has been extended still farther, and is in another vein, which dips to the south.

All these veins have a silicious gangue, and occur as fissure veins in the earlier andesite. Only the first vein struck is oxidized; in this the oxidation extends as far down as the vein has been traced, i. e., to the 535-ft. level. Very little can be told of the value of the oxidized ore except by assaying it; but when the ores are sulphides, the richer can be told by the amount of visible sulphides. However, ore which goes $40 to $50 a ton often does not show any indication of its value. Consequently, constant assaying is necessary to keep track of the ore in this mine.

The shaft, as said before, is 5x9 ft., outside of the timbers, and is timbered with 6x6-in. Oregon pine sets placed at 5-ft. centers. The shaft is divided into a hoisting compartment 4½x4 ft., and a ladder and pipe compartment 4x3½ ft. Two-inch planks, placed vertically, are used to lag the shaft. The ground is not heavy, and so the sets are only put in to hold the lagging. This shaft cost $13 to $14 per foot, most of the work being done when supplies were very high. It cost $5.50 per foot for timber, which then cost $60 per 1000 ft. instead of $37, as at present.

The sulphide vein has been opened for about 400 ft. on the 365-ft. level, and averages about 3½ ft. in width. A series of raises has been put up on the vein to the capping about 6 ft. above, which cuts the veins off. The sulphide vein is 300 ft. long on the 435-ft. level, and averages about 9 ft. in width. The sulphide orebody occurs in a series of step faults, of which there is one between the 365 and 435 and two between 435 and 535. These step faults are always toward the north. Whether there are also step faults in the other veins has not been determined as yet, they being very little developed.

At present all the drilling is done by hand, "single-jack" work being used. A man can drill about 8 ft. per shift in the porphyry and 4 to 5 ft. in the quartz. A method of mining somewhat similar to that used at the Campbird mine, Ouray, Colo., will be used. A line of strong stulls will be placed over the tracks on the main and intermediate levels to roof them over The ore will be broken down upon a floor of 2-in. planks, laid on canvas so as to catch the fines. The stopes will be filled with waste run down from above, for owing to the richness of the ore it could not be used to fill the stopes while mining out the ore. Stull-chutes and manways will be carried up through the waste filling. The mine has been connected with the Montana-Tonopah, so that it is well ventilated.

The company employs about 40 men on the two shifts, and ships about 100 tons of ore per week, which goes from $100 to $200 per ton, about two-thirds of the value being silver and one-third gold. Many shipments have averaged over $200 per ton, and one averaged $260 per ton. The company has shipped approximately 3500 tons of ore so far.

MONTANA-TONOPAH.

This mine was among the early ones to strike ore under the capping of late andesite. There are three veins, all of which have an east and west strike. Two of the veins dip to the north, but the oxidized vein, which is a continuation of the oxidized vein of the Midway, dips to the south. It was necessary to sink 350 to 360 ft. to get through the andesite capping.

MONTANA-TONOPAH SHAFT IN FOREGROUND.

The first level is at 360 ft. depth. The lowest level is 765 ft. The veins average 4 to 6 ft. in width, and are much broken by faulting. Stull timbering is used in most stopes. The mine works about 100 men and produces 20 to 25 tons of first-class ore per week, the average being about $40.75 per ton. This mine is noteworthy for the large stope of ruby silver ore which occurred in one level. About $100,000 was taken out of this one stope.

Butte, Montana.

BY W. SPENCER HUTCHINSON.*

For a number of years past the Butte copper industry has been characterized by mining litigation. The differences between mining companies were carried into the business and political life of the city and State, and a condition of general strife and uncertainty prevailed. The last year has seen a change brought about by a settlement of the controversy. No less remarkable is the confidence inspired by recent work in the mines themselves, resulting in the continual development of rich ores in depth.

FIG. 1. A VIEW OF ANACONDA HILL; THE ANACONDA AND NEVER-SWEAT MINES, IN THE CENTER, THE PARROTT ON THE RIGHT.

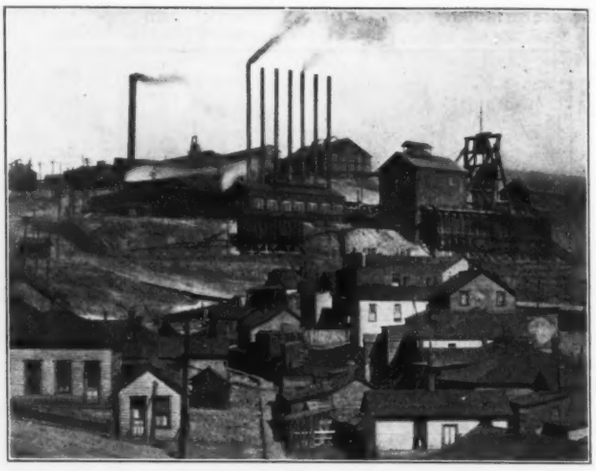


FIG. 2. ANOTHER VIEW OF ANACONDA HILL. THE ANACONDA AND NEVER-SWEAT MINES.

FIG. 3. THE BUFFALO SHAFT, MAY, 1906. A TYPE OF SHAFT HOUSE, WHICH IS BEING RAPIDILY DISPLACED.

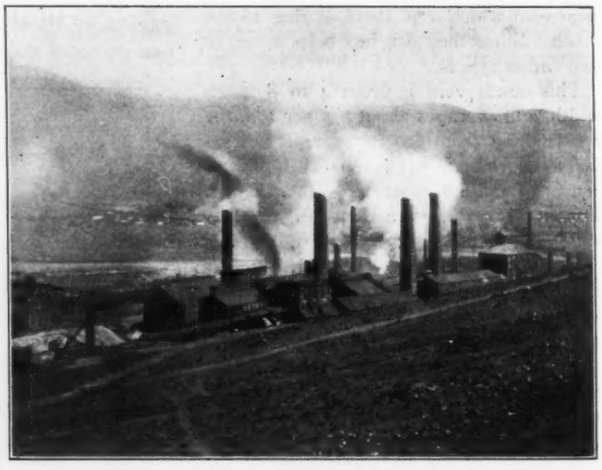


FIG. 4. THE M. O. P. SMELTER, MAY 1906. THIS SMELTER IS ABOUT TO BE DISMANTLED.

The one thing which must appeal most to the visiting engineer is the extraordinary concentration of mineralization. In an area of 1.5 sq. miles the daily ore production during June, 1906, was 14,585 tons, estimated to yield 1,085,000 lb. of refined copper. Whether this represents actual concentration of mineralization, or the result of concentrated effort in exploration and development remains to be proved. Butte has never before seen so much activity as now in new exploratory work. This was particularly noticeable in the country lying east of Silver Bow creek, in the flat and in the foothills of the East ridge. Here the Pittsburg-Montana, the Butte & London, the Butte Exploration, and the Boston & Montana are exploring their large holdings, and work is also in progress on the Birtha, the Altona and the Bullwhacker claims. In the flat the rock is buried by wash, but in the foothills there are good surface indications, and on the Birtha a large body of silicate ore was recently discovered near the surface, and shipments have been made from it for six months past. That the new work is not confined to the properties mentioned is evidenced by the generous list of stocks offered by the local mining brokers.

The old silver mines are now being reopened, and copper and zinc ores are already shipping from the Lexington. The zinc ores have been treated by the Montana zinc company, being first crushed by rolls to 20-mesh, and then concentrated on Wilfley tables. This produces a blende-galena-pyrite-chalcopyrite concentrate which is dried, sized and then separated by Blake-Morscher electrostatic machines into two products; viz., blende, which is shipped to the Kansas zinc smelters, and a galena-pyrite-chalcopyrite mixture which goes to the lead smelters. The mill has been operating successfully for some time, treating 100 tons of ore daily, and has now been enlarged. A great quantity of zinky ores suited to this process are known to exist in the old silver mines, and this is believed to be the beginning of a business of great future importance to the district.

A few years ago Butte was surrounded by smelters, but one by one they have been shut down and dismantled. The current news despatches announce that no more ore will be shipped to the smelter of the Montana Ore Purchasing Company, and that it also will be dismantled. This leaves only one smelter where there were formerly six or seven. The visitor no longer awakens in the morning choking with

*Mining engineer, 101 Milk street, Boston, Mass.

sulphur smoke, and the efforts of home-makers to have a bit of green lawn are rewarded with some degree of success. The ore is now smelted by the great plants controlled by the Amalgamated Copper Company at Anaconda and Great Falls to which it is transported by rail. These plants have introduced many economies in the handling of materials, in the use of fuel, and in the utilization of by-products. At the mines the old type of wooden shaft-house is rapidly giving way to the steel head-frame.

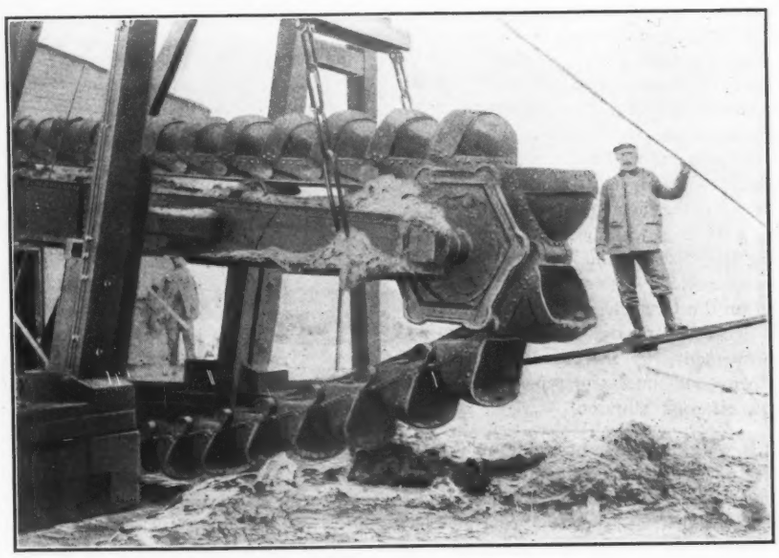
The Robinson Gold Dredge.

This new dredge, designed by A. W. Robinson, is now being introduced by the Atlantic Equipment Company, of 111 Broadway, New York. The aim has been to produce the very simplest possible construction of working parts, retaining all of the best features of both New Zealand and American practice. The result is a dredge that is light, strong, easily handled and economical to transport and erect, which can be depended on to do its work continuously with few repairs. This dredge made a remarkable run of 76 per cent. of actual working time during its trial period of 30 days; it is expected that in regular work better time will be made.

GENERAL VIEW OF DREDGE.

The dredge herein described is operated by the Gold Bond Dredging Company, Ransom's Bridge, North Carolina, on an alluvial flat through which runs a small brook (which would readily pass through an 8-in. pipe) ; this brook keeps the pond supplied. The ground is covered with heavy pine timber, which is used as fuel for the dredge; the stumps are readily dug out by the dredge itself.

The hull is of wood 94x32x7 ft. It is strongly built, and the well sides are carried aft the whole length of the boat to form bulkheads. There are also steel hog-rods forming two fore and aft trusses. the ladder frame is of steel and long enough to dredge in 30 ft. of water. The buckets are of Robinson's improved close-connected type, each of 3 cu.ft. capacity. The back of the bucket is of cast steel, the pins are 3 in. diameter, and the bushings are of manganese steel. These bushings are specially made to slip in or out of recesses shaped to a half-circle, so as to be readily renewed. The lower tumbler shaft is of hammered steel, and runs in enclosed bearings in the end of the ladder frame; these bearings also have renewable bushings. The upper tumbler is five-sided, of cast steel, and is fitted with Robinson's patent driving faces, by means of which the driving power of the tumbler is applied directly under the center of the bucket pins. The strain on the buckets is thus greatly reduced. The buckets run smoothly, discharging 24 per minute, thus giving a theoretical capacity of about 3800 cu.yd. in 24 hours. The buckets discharge through a steel hopper into the revolving screen, which is 4 ft. 6 in. diameter and 16 ft. long. This screen is made with interchangeable perforated plates on a steel frame, so that the plates can be renewed or replaced without taking down the screen.



EXCAVATING APPARATUS.

The head frame and driving gear for the buckets and screen are strong and simple, there being but two working shafts and four bearings in the entire driving machinery, including tumbler drive and screen drive. These two shafts are the upper tumbler shaft and the secondary or pinion shaft. The main gearing is of steel and a steel-rimmed pulley of large diameter on the end of the pinion-shaft is directly belted to the main engines on deck. The revolving screen is driven from the secondary shaft which is located directly above it. On the screen is a cast-steel spur gear of 2-in. pitch and 6-in. face, which also has a flange or roller plate attached to it. The screen is mounted on adjustable steel rollers running in dirt-protected bearings. An adjustable friction clutch is provided at the main pinion, which will slip in case of sudden strain, as when the buckets strike an obstruction; the belt transmission also furnishes a safeguard in this respect.

The main engines are 50 h.p. of the vertical marine type. In this case they are double cylinder high pressure for the sake of simplicity, as wood fuel costs only the labor of cutting it, i.e., about $1 per cord. Where economy of fuel is important compound condensing engines are preferable. The main engines are handled entirely by the operator on the upper deck. He has a full view of his work, and can see the buckets for their whole length, and the tailing conveyer as well.

The winch is on the main deck, directly under the operator, so that the levers for

its various motions can be conveniently placed. It has six drums, each with independent friction clutch and brake, as follows: One headline, one ladder hoist, two forward side lines and two after side lines. By means of these steel-wire rope lines, the position and feed of the dredge is under perfect control.

The water supply for the screen and tables is furnished by a direct-connected centrifugal pump with 10-in. discharge.

Steam is furnished by one Worthington water-tube boiler of 125 h.p. It is especially adapted for burning inferior wood, as the firebox is large and roomy, and covers the entire bottom area of the boiler. The boiler has a steam and water drum of sufficiently large dimensions to avoid sudden fluctuation of pressure and water level, and has proved satisfactory in service. The consumption of green pine wood is from 2 to 2½ cords per shift of 12 hours, steady working. Assuming the actual output of the dredge to be 1000 cu. yd. per shift of 12 hours (which is half its theoretical rate, and is a low average in practice), and the cost of fuel to be $1 per cord, the fuel cost is 0.25c. per cu.yd. of material handled.

The gold-saving tables are arranged on both sides of the after deck under a distributing box of special design, by means of which the screened material from the entire length of the trommel is mixed and distributed uniformly to the tables. The system of tables adopted on this dredge is a flexible one, and can be adapted to any material, and can hold any kind of riffle. There are 28 tables, each 1½x8 ft., with a total table surface of 336 sq.ft. In addition there are 94 sq.ft. of riffles in the distributing and tailing sluices, or a total of 430 sq.ft. of riffle surface on the dredge.

To cary off the coarse tailing, a stacker 70 ft. long is employed. This is of the rubber-belt type, and is driven by an independent engine. The belt is 30 in. wide, and the outer end of the conveyer is 25 ft. high above the water level. The load of all the parts is well balanced on the hull, so that it floats level at a uniform draft of 3 ft. In the accompanying engravings, Fig. 1 is a general view of the dredge, while Fig. 2 shows the ladder, buckets and lower tumbler. Their design is generally used on the Oroville dredges. This bucket was evolved for canal dredging, but since improvement (by increased strength), it has proved a successful type for excavating auriferous alluvion.

It is well known that considerable quantities of gold are systematically stolen from the Kalgurli and other mines of the Kalgoorlie district, Western Australia, but of course the precise amount cannot be ascertained. It has been estimated that the amount is as large as £1,000,000 per annum. The matter is now to be investigated officially by the Government.

Slates vary in color from black through gray to green, red and purple.

Silver King Mill, Park City, Utah.

STAFF CORRESPONDENCE.

The ore is hauled by a mule in trains of 10 cars each to the mill bin which holds 2500 tons. From the bin it is drawn off into cars and taken to platform scales where the ore is weighed. The ore is then dumped upon a grizzly with 1-in. open-

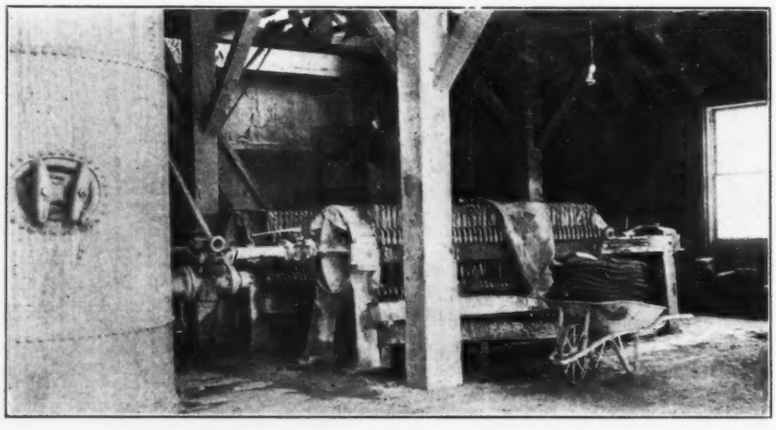
GALLOWS FRAME.

ings, the oversize going to a 10x20-in. Blake crusher, the product of which joins the undersize and goes to a 250-ton bin. It then passes to a 0.5-in. trommel, where water is added. The oversize goes to a set of 36x14-in. rolls, while the undersize joins the re-crushed oversize and is elevated to the 0.5-in. trommel. The crushed ore finally passes to an automatic sampler, which consists of a tilting box which fills with water. The full side goes down and pulls a spout across the falling ore. The lower box empties, the upper one fills, the box tilts, and another pass of the spout through the ore is made. The sample of ore falls from the spout to a series of three splitters which cut the samples in half each time. Samples are taken about every 15 minutes.

The ore, having been sampled, goes to a series of four trommels fitted with an outside spray of water. The first three of these trommels are fitted with perforated screens having 5/16-, 3/16-, and 1/16-in. openings respectively, while the last trommel has a 20-mesh wire cloth.

The oversize of each of these screens feeds two-compartment Harz jigs, while the undersize from the 20-mesh screen goes to a V-shaped settling box. The sands then go to the No. 9 jig which is also a two-compartment Harz jig, while the overflow goes to two Wilfley tables placed on the table floor. The coarse jigs treating the oversize from the 5/16-in. trommel are side-discharge, while the others discharge most of their concentrates from the hutch.

These jigs make a clean lead product, which goes to a bin on the floor below, whence it is drawn into cars and sent to the sampler. The tails go to a belt elevator and are raised to a Fleming dewaterer, or "poddle wheel" as it is called at this mill. This is the original dewatering wheel invented by J. B. Fleming, who remodeled the mill and also was the originator of the remarkable feature of this mill, viz., the concentration of the slimes by filter-pressing. This wheel is also installed at the Daly-Judge mill, where a more perfect type is used, but at the Silver King it has one feature which the Daly-Judge wheel fails to use, viz., the box in which the wheel rotates has an adjustable side so that the overflow is regu-

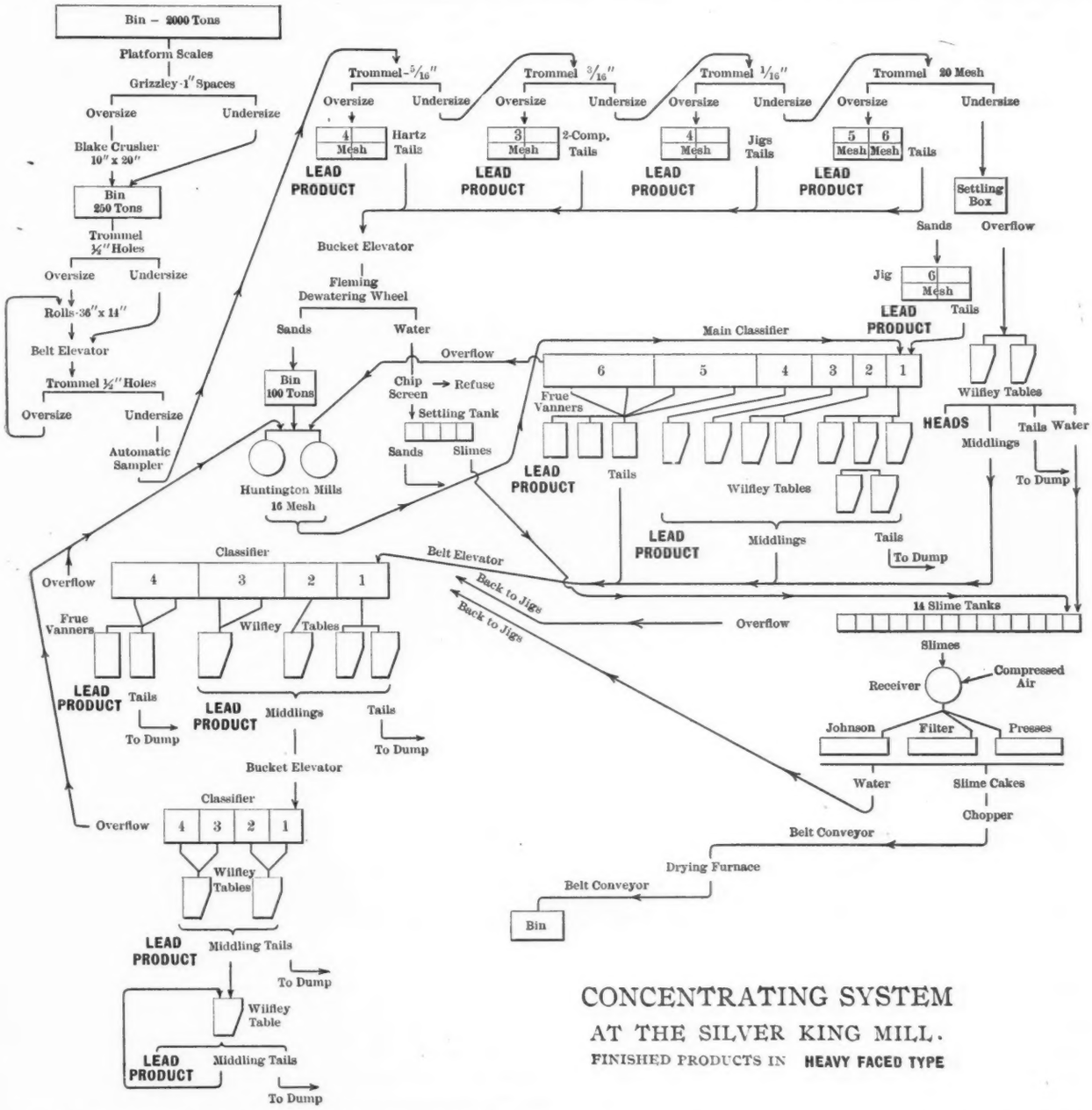


SLIME PRESSES.

lated. By lowering the side more sands go with the water, while by raising it less sands are carried away by the water. As installed at the Silver King only one set of paddles is used. The Fleming dewatering wheel is the one thing which all the mill-men in Park City unite in praising.

The water from the Fleming wheel goes to a 5-mesh trommel, which removes

chips, etc., and also any oversize which may pass the dewaterer. The pulp then goes to a 4-compartment settling tank, the sands from which go to a main classifier, while the overflow goes to the filter-press settling tanks. The dewatered sands go to a 150-ton bin, whence they are delivered by plunger feeder to two 6-ft. go to the creek, but the middlings (together with the tails from the vanners, and the middlings from the table treating the sands from the water from the jig tails) are elevated and re-classified in a six-compartment V-shaped classifier. The coarser sands from this classifier are treated upon Wilfley tables, of which the fiers is pumped by a Davis geared plunger-pump back to the Huntington mills where it is used over again. Clean water is used for feed water upon the tables. The overflow from the classifiers cannot be pumped to the jigs because the slimes in it (from recrushing the jig tailings) are too low in grade and would make the fil-



CONCENTRATING SYSTEM
AT THE SILVER KING MILL.
FINISHED PRODUCTS IN **HEAVY FACED TYPE**

Huntington mills, which have 16-mesh screens. The product of the Huntingtons goes to an eight-compartment V-shaped classifying tank.

The Silver King mill is built in duplicate as far as the main classifier, there being two crushers, two rolls, two sets of two Huntingtons, etc.

The most of the sands from the main classifier go to Wilfley tables, but those from the last two double-compartments go to three Frue vanners. The tables make a lead head, middlings and tails. The tails last double-compartment feeds two Frue vanners. The tailings from the vanners go to the creek, but the table middlings are re-elevated and taken to a four-compartment V-shaped classifier. The sands go to two Wilfley tables, where they are reconcentrated. The middling from these two tables is elevated and given a final concentration upon another Wilfley table, which re-treats its own middling. The tails from all the tables go directly to the creek.

The overflow from these three classifier-press slimes too low in grade if that were done.

The slimes, or overflow from the first settling tank which receives the water separated from the jig tailings, go to 14 settling tanks where the slime treatment begins. This is briefly as follows: The settled slimes are discharged into a launder, which takes the slime to a belt elevator, which discharges into a steel receiver 6 ft. in diameter and 10 ft. high. This receiver holds about five pressfuls of slime. The receiver being full, it is closed

and compressed air at a pressure of 100 lb. per sq.in. is turned on, which forces the slimes into three Johnson filter-presses. Whenever the air pressure falls below 95 lb. the compressor is started up and runs until 100 lb. is reached again. Two of these filter-presses are made of forty-four 26-inch circular disks, while the other is rectangular and has 30 plates, 24 in. square.

The press cakes are taken to a chopper delivering the chopped slimes to a belt conveyer, which feeds them to a steel cylindrical drier inclosed in fire brick. The dried slimes are fed by a screw conveyer to a belt conveyer which takes them to a bin, whence they are drawn into cars and taken to the sampler. The drier has not been entirely satisfactory, and it is planned to use a plate drier heated by exhaust steam passing through coils of pipe under the plate.

The trouble with this slime process is chiefly in settling the slimes and discharging them in sufficiently thick pulp to the receiver. Both V-shaped tanks, and tanks rectangular in cross-section are used These are 30 ft. to 35 ft. long, 3 ft. deep and about 3 ft. wide at the top. Spigots for discharging are placed in the bottom and also, beginning about 10 ft. from the charging end, spouts are placed for drawing off the clear water on top. The tanks also overflow at the end. The slime water is run into these tanks until the overflow becomes turbid on account of the accumulation of slimes in the bottom of the tank. Partitions are placed across some of the tanks and extending about 6 in. below the surface of the water. This is the main principle of the classifiers used at present in the Daly-Judge mill, Park City, and gives good results in settling the slimes here also.

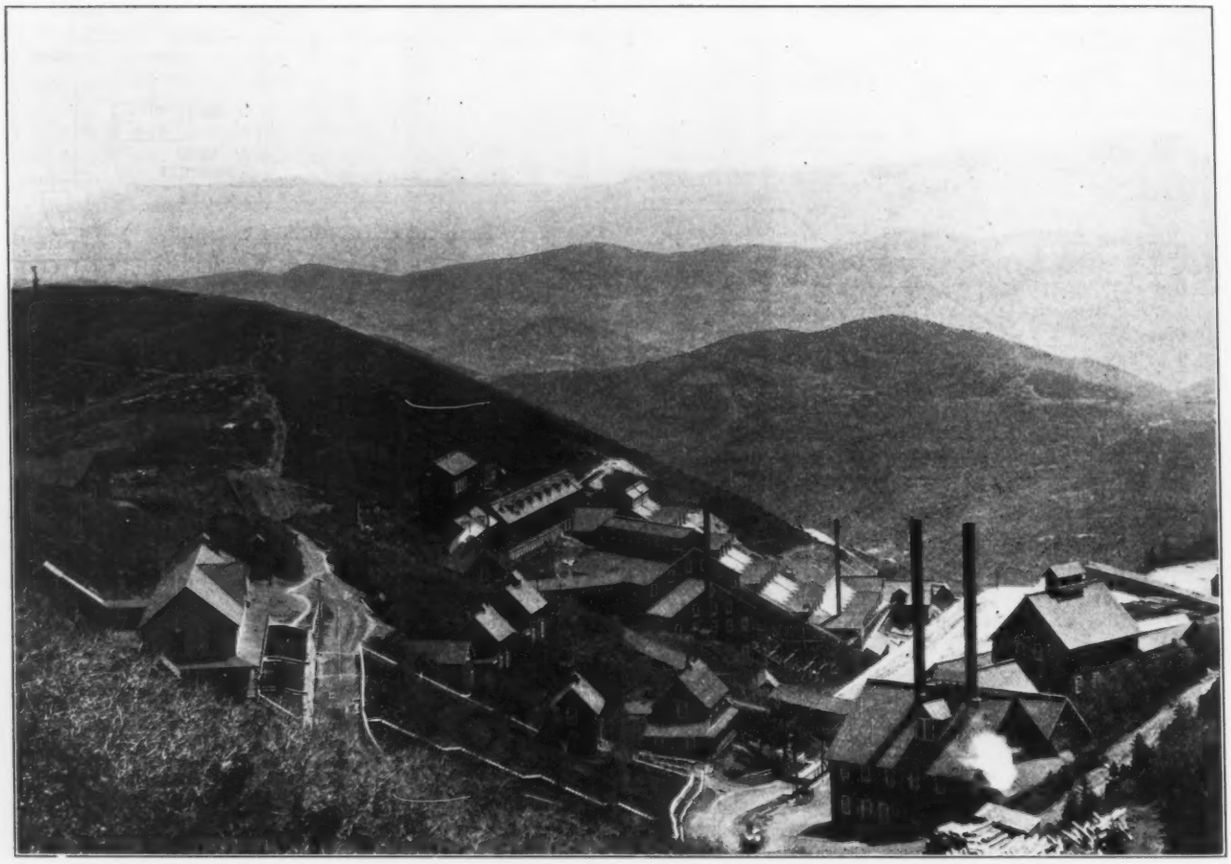
If the slimes from the tanks could be discharged continuously, the V-shaped tanks would be the better; but when the discharge is continuous, the slimes are too dilute for economical pressing. So the slimes are allowed to accumulate until the overflow becomes turbid, when the slime water from the jigs is turned to other settling tanks. As much as possible of the water on top is run off by a pivoted pipe placed in the side of the tank. The slimes are then drawn off from the bottom. All the slimes will not run out unaided, the last of them having to be scraped along to the discharge spouts. This is difficult to do with the V-shaped tanks, but when rectangular tanks are used, it can be done fairly easily. A man can get in and, using a wooden scraper the width of the tank, and having a flap of rubber nailed to it, can push the slimes ahead of him and walk behind on the clean floor of the tank. Except for this discharging of the slimes no difficulty is experienced in the process. Stiff press cakes about 1¼ in. thick are made. The presses are easily cleaned and attended to by one man. About 20 to 25 presses of one ton each of wet slimes are taken off, which contain about 18 per cent. moisture. These press cakes when dried, assay about 8 per cent. lead, 25 to 30 oz. silver, and about $4 in gold.

The overflow water from the slime tanks is pumped back to the jigs by a Davis geared plunger-pump.

All the tails from the tables and the vanners are sampled by an automatic sampler similar to the one used in sampling the crude ore.

The power plant consists of two tubular boilers, equipped with American stokers, two Corliss engines, one a cross-compound, the other a tandem-compound, both of which can be clutched to the shaft which drives the line shaft of the mill. A dynamo to light the mill is also run from this shaft.

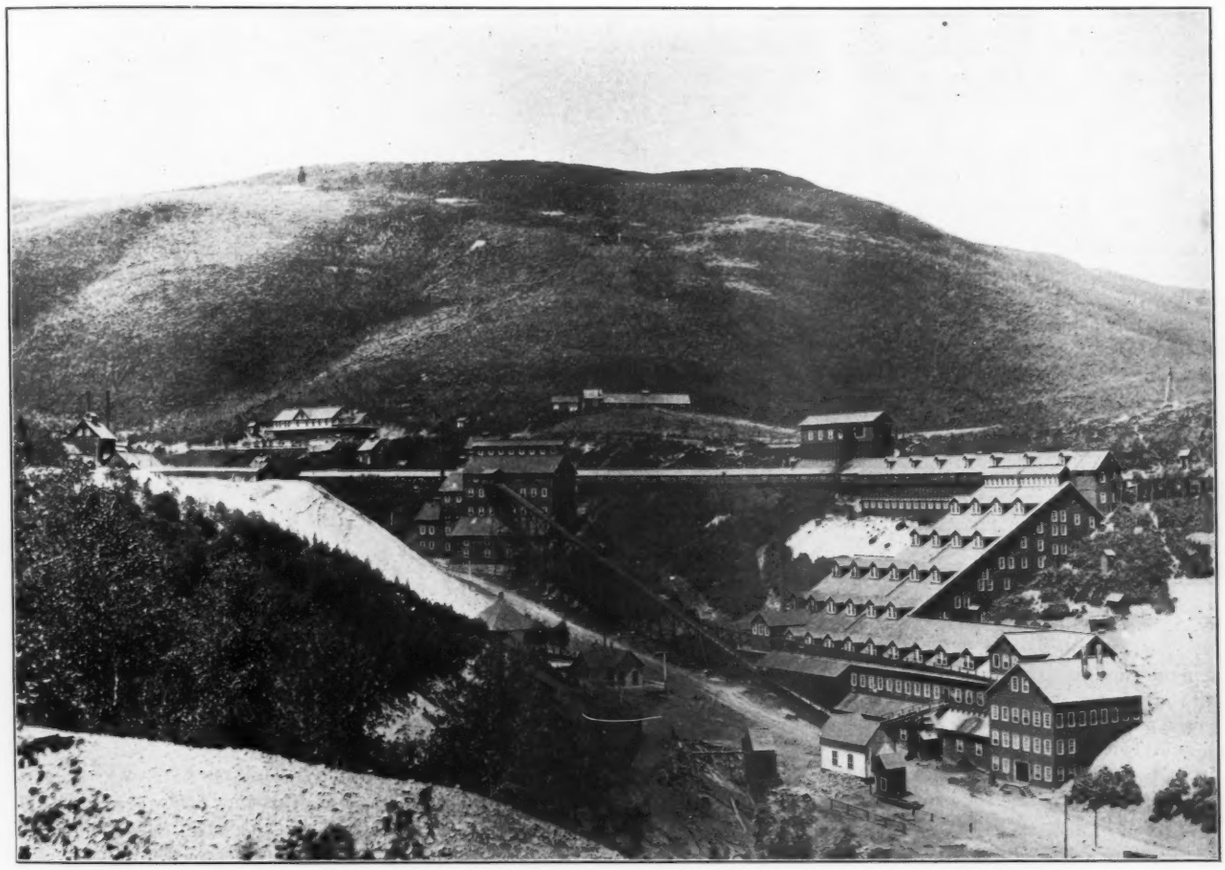
The slime plant works three shifts, but the concentrating mill only works two shifts. The mill force consists of the following men in the concentrating plant on the two shifts: Two jig men, two lookouts and oilers, two Huntington men, two table men, and four shovelers. The slime plant and engine room (both three shifts) have three mill men and three engine men. All these men except the laborers and shovelers receive $3 a day. The repair gang and machinist gang consist of one machinist at $4, and one helper at $3, one repair man at $4, and one helper at $3. The night-shift boss is paid $4.



LOOKING DOWN CANYON SHOWING SHAFT HOUSE IN THE FOREGROUND, THE SAMPLER AND MILL.

All the concentrates (both coarse and slimes) are taken in cars up an incline to the 250-ton sampler, where the first-class ore from the mine is also sampled. Roughly the course of the ore is as follows: The cars empty into four 150-ton bins. These feed by means of plunger to a 24-in. conveying belt, and go to a gyratory crusher. The ore from the crusher goes to a Vezin sampler. The sample is then sent through a series of three rolls, each product going to a Vezin sampler, which cuts out one-quarter. The rejections go to receiving bins.

The bins which receive the sampled ore and concentrates deliver to a Bleichert tramway 7000 ft. long. This tramway is belted to the sampling mill and generates about 15 or 20 h.p., which helps to run it. A pneumatic accelerator is used to start off the buckets. The traveling cable is of 1 in. diameter. The stationary cable on the loaded side is 1⅛ in., while that on the empty side is 1 in. The tramway has 39 steel towers, of which the highest is 85 ft. The longest span is 325 ft. The lugs on the traveling cable are 174 ft. apart. There are 80 buckets on the line, which hold 850 lb. of ore, and 350 lb. of coal. The speed of the tramway is about 200 ft. a minute. This tramway takes the ore from the sampler up over a rise of about 200 ft. and down to the receiving bins at the terminal about 1000 ft. below the mine.



SHOWING FROM RIGHT TO LEFT THE MILL, SAMPLER (WITH CONNECTING INCLINE) BOARDING HOUSE AND TOP OF SHAFT HOUSE.

Note on the Extraction of Copper from Atacamite.*

BY NICANOR ARGANDONA.

It is well known that at Chuquicamata, Chile, a multitude of small fissures, filled with atacamite or oxichloride of copper, traverse the country rock, consisting of granites, pegmatites, and syenites, in every direction. This kind of deposit, which appears to be in the nature of a stockwork, is known to the miners as "llamperos." A lixiviation process is usually adopted in order to extract the metal from the oxichloride.

Hitherto the difficulty has been in the filtration of the liquid containing the dissolved copper. The chemical reactions which take place in the dissolving vats, between the perchloride and oxide of iron on the one part and the ferric solution and the argillaceous portion of the gangue on the other, result in the formation of a gelatinous precipitate, which has to be washed many times in order to get out the dissolved metal.

The first part of a new process consists in converting, by the action of steam, a portion of the chloride of copper in the ore into hydrochloric acid and black oxide of copper, according to the equation:

$$CuCl_2 + H_2O = CuO + 2\,HCl.$$

A certain portion of the ore is put into large clay retorts, or into iron retorts lined with a thin coating of clay, and exposed, at a temperature of 230 deg. C., to the action of steam. Theoretically, there is sufficient water of combination in the ore itself to supply the quantity of vapor needed. The expenditure of steam is therefore small, but a certain quantity is necessary in order to accelerate the reaction. The black oxide resulting from this process can be reduced by smelting.

The second part of the process consists in submitting the ore, which contains from 3 to 4 per cent. of copper, to the action of the hydrochloric acid obtained as described above. For this purpose cylindrical wooden or brick vats are used, having a special lining of pitch. Ordinary filters can be employed in this operation, as no gelatinous precipitate is produced. Elmore's centrifugal filter is recommended, for about 100 tons of pulp can be filtered by this means in 24 hours, with an expenditure of only 8 h.p.

*From London *Mining Journal*, June 30, 1906.

Manganese-bronze has practically driven aluminum-bronze out of the market, or to such an extent that the disparity in the quantities used is very great. This condition has taken place not because of the superiority of manganese-bronze over aluminum-bronze, but because it is cheaper (containing nearly half zinc) and may be more easily cast.

A Simple Device for Separating Sands from Slimes.

BY COURTENAY DE KALB.*

The accompanying drawing illustrates an exceedingly simple and inexpensive apparatus, which after two years' testing in constant use in two plants has proved to be very efficient as a separator for taking out even extremely fine sand from slime. It is nothing more than a common pipe fitter's job to make the separator, ordinary pipe and fittings being used throughout.

The apparatus was designed by me, is unpatented, and is offered to the profession as a convenient means of solving an often troublesome problem. The only difficulty which the device presents is the amount of vertical elevation required. In many plants this would be an obstacle to its use.

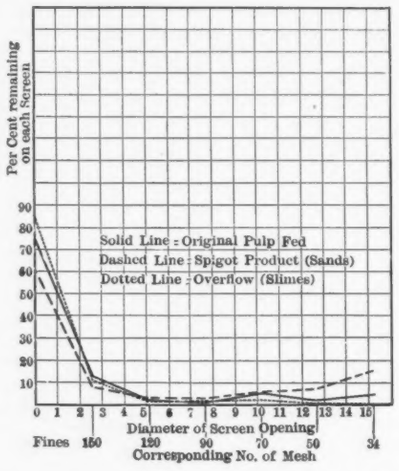
It consists of a 4-in. pipe, 12 ft. long, with a 4-in tee, and nipple *N*, and a short length of 4-in. pipe above the tee, carrying a cap through which a hole is tapped for a 1½-in pipe *F* so placed that when the apparatus is set up at an angle of 60 deg. from the horizontal, the pipe *F* will lie near the lower side of the 4-in. pipe, and extend to a distance of 2 ft. below the nipple *N*. At the lower end of the 4-in. pipe is another cap, which is tapped for a 2-in. discharge pipe, and a 1¼-in. fresh-water pipe *W*, disposed so as to bring the discharge as near as possible to the lower side of the 4-in pipe, and the fresh-water pipe as near as possible to the upper side. The fresh-water pipe should extend about 2 ft. above the cap.

The pulp should be fed through the pipe *F*, and, while not absolutely necessary, it is desirable that it should have been previously thickened. The spigot, or discharge pipe, is controlled by an ordinary iron plug-cock. It is best to discard the iron plug which comes with such a cock, and substitute for it a similar plug made of maple or oak, or, better still, of boxwood (linden). A hardwood plug in an iron cock will be found to wear many times as long as an iron plug, and to give much less trouble from leaking.

The pulp issuing from the 1½-in. pipe *F* will roll over and over, down the lower side of the inclined 4-in. separating tube, giving the ascending current the best possible opportunity to wash out and carry upward the slimes, while there is less opportunity for lifting the fine sand than occurs in an ordinary hydraulic classifier. The overflow of slimes takes place through the nipple *N*, while the washed sands are drawn off through the spigot *P*.

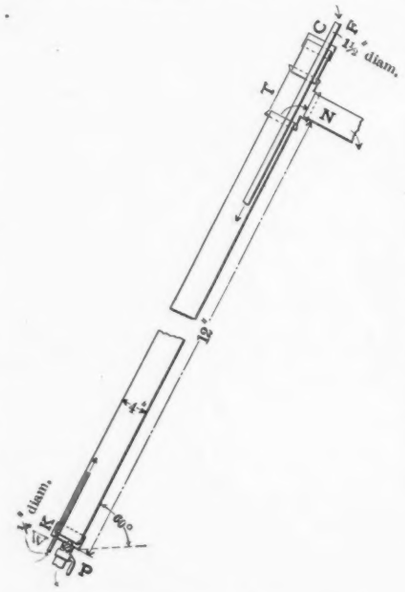
The amount of fresh water fed through the pipe *W* will depend upon the thickness of the pulp entering the separating tube from the feed-pipe *F*. The thicker the pulp the better; but good work can be done with pulp carrying as little as 10 per cent. solid matter, and very fair classification has been attained (better than that given by most classifiers in use) with pulp containing only 3 per cent. solid matter.

The capacity of such a tube as that described will, of course, vary with the dilution of the pulp, but four tons per 24 hours


Per Cent remaining on each Screen
Solid Line = Original Pulp Fed
Dashed Line = Spigot Product (Sands)
Dotted Line = Overflow (Slimes)
Diameter of Screen Opening
Fines
Corresponding No. of Mesh

CURVES SHOWING SEPARATION OF SANDS FROM SLIMES IN PULP CARRYING 10 PER CENT. SOLIDS.

would be a maximum for the best work, even with very thick pulp. Crowding beyond this limit is at the expense of cleanness of separation, and induces greater danger of clogging the spigot.



DA KALB'S SAND SLIME SEPARATOR.

Many very extraordinary screen analyses have been obtained from products treated with this device, but to select a severer test, where pulp containing only 9.5 per cent. solid matter was separated, the creditable results shown in the accompanying table were obtained.

It should be stated that the pulp treated had been passed through another form of separator for removing the coarser sands before going to the separating tube, and this fact, taken in connection with the dilution of the pulp, must be borne in mind in estimating the value of the work accomplished. The accompanying curves facilitate an understanding of the extent to which the separator has reduced the sand contents in the overflow under difficult conditions.

SCREEN ANALYSIS.

Mesh.	Diam. of Screen Openings. Mm.	Pulp Fed. % Remaining on Each Screen.	Spigot Product. % Remaining on Each Screen.	Overflow (Slimes). % Remaining on Each Screen.
34	.1524	4.77	15.03	.47
50	.1270	1.67	7.34	.93
70	.1016	5.21	5.55	2.24
90	.0762	.38	1.93	1.12
120	.0508	1.32	2.05	1.49
150	.0254	11.84	8.33	10.73
under 1500	.....	74.83	59.77	83.02

Alcohol in Industry.

As a result of the passage of the bill allowing the sale of alcohol without the Internal revenue tax, the Department of Agriculture has decided to publish a bulletin on Jan. 1, 1907, when the law goes into effect, giving the public a collection of the best obtainable data on the use of alcohol in small engines. For this purpose Charles L. Lucke has been retained by the Department as expert to conduct these investigations in the laboratories of Columbia University. The scope of the work being extensive, he is anxious to secure the co-operation of everybody interested by first giving the fullest publicity to the investigations. If any of our readers have patents on the subject, or if they have vaporizers, carbureters or complete engine, they are invited to submit the data or pieces of apparatus to tests. These tests will be conducted without any expense whatever to the public, except the transportation of the apparatus. Any data or shipments should be addressed to Prof. Chas E. Lucke, at Columbia University, New York.

The Ontario government has authorized the construction of new branch lines of the Timiskaming & Northern Ontario Railway. One of six miles will run from Englehart to Charlton, serving a district around Long lake. Another will run from a point near Cobalt to Kerr lake six miles, affording shipment facilities to 13 working mines which produce low-grade ores. It will also serve the mineral-bearing section of the Gillies timber limit when its operation is undertaken by the government.

*Mining engineer, Los Angeles, Cal.

An Experimental Colliery.

BY HENRY BRIGGS.

The experimental mine of the new university of Birmingham serves a three-fold purpose:—

(1). To exemplify the laying-out of a colliery, and the systems of working coal.

(2). To illustrate the methods of ventilating underground workings; to enable tests to be run on fans; and to enable research to be carried out on the principles of ventilation.

(3). To form a practice ground for mine surveying.

The mine itself is laid out to demonstrate the two main systems of working coal; the district *B* (Fig. 1) representing a bord-and-pillar panel in a 5-ft. seam, and *C* a longwall district in a 3-ft. seam. The whole is constructed half size, and is intended to represent, in as simple and clear a manner as possible the best modern practice in the exploitation of coal by these two systems, and the method of ventilating the workings. The area under which the underground galleries extend is very nearly one acre, and the length of the main intake road is 120 yd. When it is stated that the total length of the underground roadways is no less than 1050 yd., or about three-quarters of a mile, it will be comprehended that this attempt to co-ordinate more perfectly the practical and theoretical aspects of mining has been designed in no small way. The mine was constructed to plans drawn up by Professor Redmayne, head of the mining department at the university, and the work proceeded under his personal supervision. The excavations were made on the "cut-and-cover" system, and as might be expected, the roof of the galleries is nowhere more than a few feet below the surface of the ground. (See Fig. 2).

The upcast and downcast shafts (*U* and *D*, Fig. 1) are respectively 3 ft. 9 in. and 4 ft. in diameter, and are sunk to a depth of 11 ft. They are brick lined, and mounted each with a coping of stone raised 3 ft. above the surface of the ground. The upcast shaft is closed by a hinged lid of stout sheet-iron, and starting about half way up the shaft is the fan drift (Fig. 5) forming the connection between the mine and the fan chamber. Iron steps let into the sides of the shafts form the means of ingress and egress.

The only thing left to the imagination in this experimental colliery may seem an important one, viz., the coal; but, considering that the galleries are excavated out of glacial drift the non-appearance of coal can hardly be wondered at. Its place is taken by concrete, and indeed the whole of the roadways in the mine have walls and roof of concrete 6 in. thick. The roof is further strengthened by steel bars of rail section placed at intervals of 3 ft. and imbedded in the concrete. The two air crossings whose positions are indicated on the plan, and details of which are shown in Figs. 3 and 4, are constructed of brickwork, and, like the rest of the mine, are half the usual size.

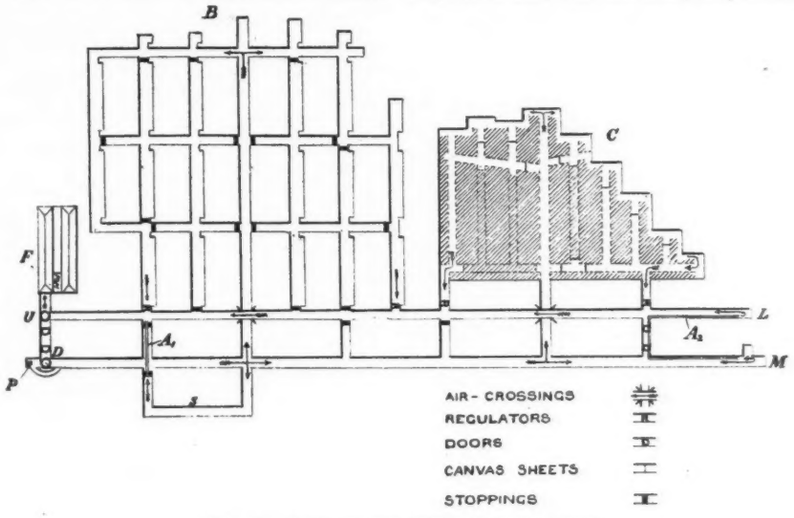


FIG. 1. PLAN OF THE EXPERIMENTAL MINE.

Although the concrete keeps almost all the water out of the mine, a little manages to leak through and collects in a sump (*P*, Figs. 1 and 2) near the bottom of the downcast shaft whence it is lifted to the surface by a small centrifugal pump direct-coupled to its electric motor.

In Fig. 1, *S* denotes the position of the stables, which are placed according to the most approved manner, not in the main intake, but near it, and fed with air by a separate small split. The air passing from the stables is carried away by an air-pipe, 5 in. square, passing over the intake (*A*, Figs. 1 and 2), through the stopping in the cross-cut opposite, and into the return. The cross-cut connecting the bottoms of the two shafts is closed by two wooden doors fitting very tightly in their casing; the same is true of the last cross-cut, "in-bye." The headings *L* and *M* (Fig. 1) are supposed to be in process of being driven forward with a break-through just striking across from *M*. These advance headings are ventilated by an air pipe (A_2) which passes from *M* through the posts of the doors in the last cross-cut and thence to *L*, thereby demonstrating by actual example the advantages and disadvantages of this method of ventilating advance faces.

In both the bord-and-pillar and longwall districts the cleavage of the coal is supposed to run parallel to the main intake and return roadways; i.e., in the direction of dip of the seam. The bord-and-pillar panel represents that stage of the operations in bord-and-pillar working known as "working in the whole;" the pillars are in process of being formed or blocked-out of the solid coal. The central road of the panel is driven narrow (4 ft.). All the other rooms are widened on the rise side to a width of 6 ft., but narrowed where they meet the headings so as better to support the roof at these points. All entries, as is usual, are driven narrow. The method of working and of ventilating this panel exemplifies north of England practice in the bord-and-pillar working of a non-gassy seam.

The longwall district shows that system of exploiting coal in a 3-ft. seam, with a stepped face advancing. By a study of this small district a student cannot help but acquire many of the salient features of longwall working. He learns, for instance, how the general direction of advance of the face must be kept in a diagonal line to the cleat; how the packs are placed; the various methods of supporting the roof at the face, and of supporting the face itself; the necessity of ripping the roof in low seams to create hight in the gateroads; and, perhaps most important of all, how the air is delivered to the working places.

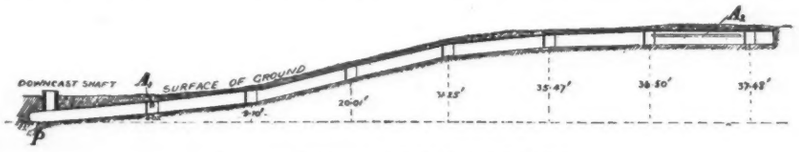


FIG. 2. SECTION ALONG MAIN INTAKE.

Moreover, as the districts are in such close proximity, comparisons can be drawn between the two systems of working, and many of the advantages and disadvantages of each pointed out on the spot.

The fan house, whose position is shown at *F* (Fig. 1), is the most important adjunct to the mine. In outside dimensions it measures 40 ft. long by 18 ft. wide, and it had been constructed to accommodate three fans. At present only one fan is in position, but steps are being taken toward

the installation of a second, and it is hoped that very shortly there will be the full complement of three entirely different fans in the house. The educational benefit which must be derived by students from personally conducted experiments with this part of the plant will be at once obvious to all mining engineers. A student will be able to run each fan separately, and make elaborate tests on their respective mechanical efficiencies under varying conditions as to the water gage, quantity of air, speed of fan, and driving power. By such tests he will be able to form correct ideas regarding the most suitable

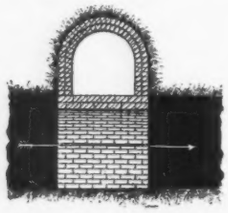


FIG. 3. CROSS-SECTION OF AN AIR-CROSSING.

type of fan to use for certain conditions, and he will furthermore learn much regarding the general principles of construction of mechanical ventilators.

The fan at present in position in the fan house is one of the Capell type, 5 ft. 6 in. in diameter, 2 ft. 3 in. wide, with a single orifice 3 ft. 9 in. in diameter. It was designed for a water gage of 2 in. and subsequent testing has shown that its efficiency reaches a maximum at this pressure. It is belt driven by a 20-h.p. continuous current motor, which has in connection with it a variable resistance, by means of which the motor may be driven at any of six different speeds, while from the readings of a voltmeter and ammeter nearby, the student is able to calculate quickly the power being absorbed.

In the mine, the amount of resistance to the motion of the air current can be varied to almost an infinite extent. Any one of the four regulators shown in Fig. 1 may be wholly or partly opened; the air

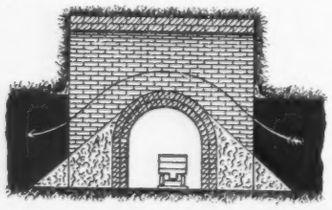


FIG. 4. SIDE-ELEVATION OF AN AIR-CROSSING.

may be short-circuited by opening the doors; or, by closing all doors and regulators, it may be forced to travel against great resistance through the two air pipes A_1 and A_2. To quickly alter the resistance to flow, at the top of the fan drift a fifth regulator has been placed; by means of this, differing conditions as to water gage and quantity of air may be obtained without the delay occasioned by a journey to the underground regulators. As all the underground roadways have smooth and even sides, the sectional area at any place is easily determined, and measurements of the velocity of the air current with the anemometer are also greatly facilitated by this uniformity of construction.

Occasional investigations have shown that the laws of friction of air currents are by no means as simple as the textbooks would have us believe, and that a great deal has yet to be learned regarding them. Should the experimental mine be the means of helping elucidate these important problems in ventilation, the cost of its construction will be amply repaid by the benefits resulting to the entire mining profession from such knowledge.

Perhaps the most important of the three purposes the experimental mine fulfils is that of forming a practice ground for mine surveying, and indeed a better one could hardly be imagined, especially when it is taken into consideration that most of the students in the department specialize in coal mining.

The surface triangular scheme and the underground surveys are connected by the aid of two plumb-wires (one down each shaft) suspended from stout wooden tripods, standing over the shafts. The main roads, intake and return, are pegged out with stations in the roof. A theodolite traverse is run between the two wires, from which, by the help of rectangular coordinates the connection is effected. Owing to the use of iron supports in constructing the mine, the compass needle cannot be used with accuracy. As the mine galleries are laid out on a hillside of variable slope, they afford some excellent leveling practice. Fig. 2, which is a section along the main intake, gives a clear idea of the conformation of the ground. The average gradient along this roadway is about 8 deg., although in one place it rises to 13 degrees.

Two further uses to which the mine will be put are the demonstration of the various modes of timbering, and systems of haulage, but although the former could well be made a strong item in the course of instruction, yet these must always be quite subservient to the three main functions of the mine dealt with above.

Coal Compression in Coke Manufacture.

Much attention is being directed to the advantages resulting from compressing coal before charging it into the coke oven. Several devices to serve this purpose have been perfected and used with moderate success. Great Britain and Germany have obtained the best results, although operators in this country are now considering the subject, and in several instances are securing satisfactory action.

After the coal is finely crushed, it should be sufficiently wetted so that after compression it will stand being charged through the oven door, supported only on a moving plate. After the coal cake is inside the oven, the door is lowered and the plate withdrawn.

The advantages of this method of working are: (1) Net increase in coke output, amounting to about 10 per cent.; (2) increase in the strength of the coke, accompanied by a firmer, denser cell structure, and higher specific gravity; (3) the spongy appearance of the top coke is eliminated; (4) there is less breeze made, and the coke is of more even size.

Owing to the increased amount of

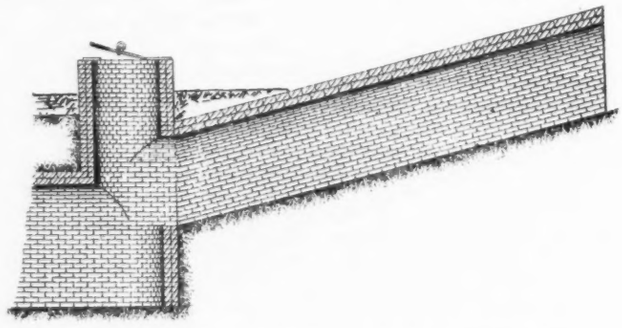


FIG. 5. SIDE-ELEVATION OF UPCAST-SHAFT AND FAN-DRIFT.

water necessarily present in the compressed coal, there is an increase of about 20 per cent. in the coking time of the coal. This disadvantage, combined with the fact that the system requires an additional labor cost and repairs to the machinery has been the principal factor in preventing its more general adoption.

It is further true that coals which expand strongly during coking are not adapted to the system because of damage done the oven walls through the increased tendency to expand. On the other hand, there are a number of coals which are not now successfully coked, that could be profitably worked when such a method is in use. Like many other improvements necessitating some outlay, the question will not be squarely faced until necessity requires.

An extensive deposit of iron ore is reported to have been discovered at Hawk Lake, a point on the Canadian Pacific railway, some 20 miles east of Kenora, in western Ontario.

Deep Coal Mining.*

BY GEORGE FARMER.

The report of the British Royal Commission on Coal Supplies has proved of more than ordinary interest to mining engineers, more especially with regard to the proposed depth-limit of 4000 ft. It must be admitted that physical difficulties become serious at this depth, and the effects of crush may be greater in working these deep seams than those at moderate depths. The chief problems, however, to be solved in deep-mining are high temperature and cost; to these may be added mechanical appliances, such as coal-cutting machines for thin seams, and the general adoption of the "longwall" system.

Numerous experiments have been made with the object of determining the rate of increase of temperature. After reviewing the evidence laid before it, the Royal Commission decided that the rate of increase of temperature may be taken at 1 deg. F. for every 60 ft. The Royal Commission on Coal Resources in 1871, arrived at the conclusion that at a depth of 3000 ft. the temperature of the earth would amount to 98 deg. F. A difference of about 7 deg. seems to exist between the temperature of the air and that of the working-faces under the "longwall" method of working, and this multiplied by 60 represents a further depth of 420 ft.; so that the depth at which the temperature of the air would become equal to that of the blood would be about 3420 ft.

When the temperature reaches 80 deg. F. and the air is moist, it begins to affect the physical power of the miner. Drying the air would constitute another danger, that of filling the roadways with quantities of fine coal-dust. It is evident that a high temperature is endurable very much in proportion to the dryness of the air, while the same temperature when saturated with moisture may be intolerable. Since the water, which is generally present in shallow mines, lessens as the depth increases, and ceases altogether at a depth of about 1800 ft., it follows that the air in deep mines is comparatively dry.

It might be thought that an effective ventilation would so keep down the temperature as to give the ability to work at great depths. The rapidity with which the air takes up heat from the working-faces depends to some extent on the system of working, and this absorption only ceases when complete assimilation of the temperature is effected; although in some cases, under the longwall system, the air has retained an inferiority of temperature after sweeping past the coal-face. An increased ventilation may be obtained by increasing the ventilating power and the velocity of the air, but only at an excessive cost. Or an increased ventilation may be obtained by making more intake-airways into the coal-face, but here again an excessive cost interferes, while extra airways would certainly afford extra surfaces, from which the air would take up heat. Another suggestion is to make the airways larger than at present. It is not supposed that an increased velocity would either increase or decrease the temperature, for Sir Lindsay Wood has shown the approximation of the temperature of the air to that strata through a distance of 10,266 ft.; and he found at that distance, that no perceptible difference took place in the temperature of the current when reduced from 41,800 cu.ft. to 3000 cu.ft. per min. It has been found easier to work in velocities of 8.25 ft. per sec. and the atmosphere at 100 deg. F., than in weak currents with a temperature of 86 deg. F. especially where the atmosphere is dry. This is explained by the refreshing feeling due to the evaporation of the perspiration on the workman's body.

Another suggestion worth consideration is the possibility of cooling the air. Water has been tried for this purpose, but its use upon shale at a high temperature causes the latter to swell, and leads to a prohibitive expense; at the same time, it may render work uncomfortable owing to the combination of moisture with high temperature. Compressed air passed through condensers, surrounded by cooling jackets, and then conveyed in pipes down the shaft and delivered in the roadways of each district, or delivered near the coal-faces, would certainly assist in cooling the air, and reduce the percentage of moisture, but this entails considerable expense. A suggestion worthy of consideration and discussion is the possibility of using liquid air, which would be quite safe, and could be applied both to cooling and haulage purposes.

It is utterly impossible to speak with certainty, of the effect of the accumulative weight of the strata in mines 4000 ft. deep. In all probability one effect is to increase the density of the strata, and of the coal itself, and so to increase the difficulty of extraction. The increased firmness and adhesion of the strata will be felt at such a depth; but the increased firmness will not prove beyond the powers of manual skill and mechanical contrivances. With regard to the roof-pressure, a vague idea only can be formed. In some of the deeper mines no more roof-pressure has been experienced than in some of the shallow mines. In the attempt to control the roof-pressure, so that it shall be neither too great nor too small, but just sufficient to break down the coal that has been holed, it is necessary, and important, to maintain a uniform line of face. For the proper and economical working of coal-cutting machinery a uniform face is also required; hence, little difficulty should be experienced in this. A uniform face of coal permits of a uniform system of timbering and packing being easily carried out, and it is possible to maintain a full control of the roof-pressure.

It has been generally decided that seams less than 12 in. in thickness cannot be worked profitably by present methods, although in thin seams, the adoption of the longwall system is generally advised. It has also been suggested that were we to find these thin seams associated with fireclay or ironstone, both might be worked together with decided advantage. Here again it will be found necessary to universally adopt, both coal-cutting machinery and coal-conveyors, working on long lengths of face.

Lighting might seem at first sight a little out of place in the consideration of deep-mining; but since it may be found necessary to adopt velocities of air currents of, say, 8.25 ft. per sec. or even higher, it will no doubt become serious. Of course, electric portable lamps may be used with the advantage that they do not depend on the outer atmosphere and could not rob the mine air of its oxygen, besides they may be safely carried in a current of any velocity. In gassy workings, an electric lamp should be fitted with a diffusion-cell for the purpose of indicating the approaching danger of fire-damp.

In all probability deep seams may be expected to prove more fiery than the present seams. There may be equally as much fire-damp given in some of the shallow mines as in the deep mines, but from the fact that the strata are not so dense, the actual quantity of gas is not apparent. With deep seams, where the overlying rocks are of a harder and denser character, any gas actually contained in the seam will be given out into the workings and roadways instead of being allowered to permeate through the strata. The question here arises as to the safety of explosives. It would be highly advantageous to safety if explosives could be dispensed with altogether for blasting in coal mines. I am of the opinion that, before long, substitutes for explosives, which will probably do the same amount of work, will be introduced for use in coal. It may here be cited that the Royal Commission appointed to inquire into accidents in mines, said: "In some coal seams the lime cartridge will perform work quite equal to that accomplished with powder, at no greater cost, and with absolute immunity from risk of explosion."

It has been suggested that as mines become deeper, the seams would be more subject to spontaneous combustion. It is reasonable to believe that every seam whether deep or not, will be subject to gob fires, if other necessary conditions are present. Three conditions are necessary

*Abstract of a paper in the *Iron and Coal Trades Review*, June 15, 1906.

for spontaneous combustion, viz.; a supply of initial heat, a supply of oxygen, and a supply of combustible material. Although in deep mines the first condition will be always present, it does not follow that the other conditions will also be present, any more than they are now. From experience, the writer is convinced that more or less regular control of the roof-pressure, and the composition and nature of the overlying strata, play more than an ordinary part in the origin of gob fires.

As mine-shafts become deeper, it will certainly be necessary to increase the quantity of mineral to be dealt with in each trip, and also to increase the speed at which that mineral is hoisted. The net loads raised at each wind will be considerable, while the time occcupied per wind must be of the least possible duration, in order to maintain the required output. This naturally demands a more than proportionate increase in the masses of the ropes, pulleys and drums; and the power of the engine must be amply sufficient to cope with the great inertia of these masses. No limit has yet been reached nor is it likely to be reached, in the power of the engine, although some attention might be turned to the waste in winding engines.

It is evident that the question of counterbalancing the load will require serious consideration. Many old contrivances are now used, and some do useful work by insuring a constant static movement. Especially is this the case where an old winding rope is applied as a tail rope slung beneath the cages, but such method must surely be unsuitable in a deep shaft, from the very heavy strain on the capping of the winding rope. Some means must be adopted that will not put an extra strain on the winding rope, as the ordinary strain will be quite sufficient. For this reason, it is probable that the spiral drum will become of universal use in deep mines, as it permits a perfect counterbalance of the rope, while a further increase in the ratio of the large radius to the small radius would involve an overbalance in favor of the engine at the commencement of the wind; and in favor of the brakes at the end of the wind.

Although an exact balance could be obtained from the spiral drum, it is usually found that the drum is so constructed as not to give an exactly uniform load during the wind. The reason for this is that the empty load, remaining on the large diameter during the first few revolutions, gives more assistance in starting the engine to get up speed quickly; while the full load, getting on the larger diameter a few revolutions before the end of the wind, gives more assistance in stopping the engine.

Nothing in the winding appliances calls for so much consideration as does the winding rope. In shallow mines, the weight of the rope is only a small item, but when that weight reaches 12 to 14 tons, the item becomes one of vital importance. Allowing the usual factor of safety in mines of excessive depth worked by a single lift, it is evident that, if the winding rope were of the same section throughout, the great weight of the rope alone would necessitate its being made of a very heavy build, and a good part of the strength of the rope would be taken up in carrying its own weight. To remedy this, the use of tapered ropes has been suggested,, and in many places they have already been used. The construction of these ropes causes them to be very costly, and owing to technical difficulties they cannot be made in so perfect a manner as ordinary ropes. Some tapered ropes have been made with a regular and uniform taper, and have been used in deep shafts on the Continent, but it has been thought desirable, and certainly cheaper, to make a long rope in lengths of, say, 500 ft., and joined together, the section of each length being less than that of the one above it. Where the joinings were made, it would be necessary that they should embrace a fair length of rope, so that the change in strength would not be too sudden—a condition which would be an inevitable source of weakness.

A diminishing factor of safety for the winding-rope might be adopted, both for the sake of economy in first cost and in order to insure a more even load on the winding engine, but such a step should only be adopted after careful thought.

Close attention and consideration will be needed to reduce sufficiently the temperature of the mine so as to afford a reasonable amount of comfort to the workmen. This may be done by using compressed air as a motive power in and about the workings, the air being compressed by electric motors near the pit bottom or on the main intake-airways, so as not to reduce the efficiency. The use of water would be injurious to health, and at the same time ruinous to the adjacent strata.

Ventilation will be needed to flow at higher velocities, because it is found that men can work in a high temperature with air at a high velocity, better than in the same temperature, or even a lower tempature, at a low velocity. Quicker velocities will lead to improvements in the safety-lamp or in the adoption of the electric hand-lamp.

Explosives will only be used with extreme caution; and it is quite likely that efficient substitutes for explosives may be found.

The longwall method of working is quite likely to be universally adopted, owing to its ease of simple and adequate ventilation. The coal-faces will be worked forward in a regular line, followed by a regular line of timber, both being conducive to a regular line of break; and for this purpose coal-cutting machines will be more extensively used. The faces will be set out in long lengths, and the coal will be carried along the faces by means of coal-conveying machinery.

The main haulage will be carried out by means of an electrically-actuated power plant situated at or near the pit-bottom. Machinery may also be used to compress air for use as the motive power of secondary haulage, coal-cutters, coal-conveyors, etc. From this machinery, or other machinery on the same cables, air will be compressed for cooling purpose.

Careful consideration will be given the question of spontaneous combustion, in the laying-out of the workings; and the mine must be planned and worked with the intention of preventing the occurrence of gob fires.

The shafts and winding appliances will be designed and installed with the view of dealing with a large net load, in a minimum time of winding. The guides must be rigid, and probably a more extensive use of steel rails will be adopted. In dealing with the load in the shaft, counter balancing wlil be found inevitable, but the use of such a counterbalance must not put any extra strain on the capping of the winding-rope. In come cases, a system of dealing with the load at stages in the shaft may be adopted, or some system of winding with the use of tipping-boxes. Where such a system is used, however, it may be found advantageous to use the upcast shaft for winding purposes, on account of the large amount of dust which would be raised.

I am aware that the cost of fitting an ideal mine might become prohibitive, as the working of seams at depths of 3,000 to 4000 ft. would entail the expenditure of much capital in the sinking of wide shafts, and in the laying out and equipment of the surface and underground works; and to insure an adequate return, the most rigid economy must be exercised and practised.

The greatest injury rendered a hoisting rope is due to shocks from suddenly picking up the load, and where keps are in use so that the cage has to be lowered on and lifted off; the slack rope which occurs in this operation is the chief factor that tends to kill the rope. A series of tests carefully determined by a dynamometer showed that when an empty cage was lifted gently, the strain on rope was 4030 lb. When cage was lifted with 2½ in. slack chain, the strain was 5600 lb. With 6 in. slack chain, there was a strain of 8950 lb., while with 12 in. slack, the strain was 12,300 pounds.

Where the cleavage planes of a coal seam are well defined, it is generally advisable to drive the cross entries to the butt, and work all rooms against the face of the coal. This gets the coal out in better blocks and with less labor on the part of the miner.

Colliery Notes.

In many cases, coke is improved by dampening the coal, up to 5 per cent. of water, before charging. This facilitates charging the ovens, as the coal is not so fiery.

For transmission of power in mines where compressed air is used, it has been found that, for general purposes, a moderate pressure of 6½ to 7 atmospheres is the best practice.

Ash, when present, reduces the calorific value of coke, and in iron smelting it is necessary to supply additional fuel to convert the ash into slag. Ash also tends to weaken the structure of coke.

Bee-hive coke possesses a more silvery gloss than by-product coke, which is mainly due to the smaller amount of graphitic carbon deposited on the latter coke, and the method of quenching outside the oven.

The dust, or breeze, made in the handling of coke, can be satisfactorily used for boiler fuel. When this is done, a special form of grate bar is necessary, having small circular draft openings and operating under a forced blast. Coke breeze can also be used in the lining of steel furnaces, and for making briquets.

It is claimed that by softening the feed water of colliery boilers, there is an increase of calorific power; less deposit of scale; boilers easier to clean; pitting, corrosion, and grooving is diminished; there is less danger from overheated plate; life of boiler is increased; feed-water pipes are kept clear; and priming is prevented.

Connellsville coal containing 32 per cent. of volatile matter does not give as an average coke yield more than 63 per cent. of the coal charged under favorable circumstances. Pocahontas coal having 22 per cent. volatile matter does not yield over 50 per cent. coke. Imperfect regulation of the air admitted to the coking chamber is the chief source of loss.

It would be beneficial to the mining industry if the laws of every State called for a careful test of all explosives intended for use in the mines. Many accidents have occurred from the use of explosives containing improper mixtures, or ingredients of inferior quality. Each explosive, after satisfactorily passing the tests, should be placed on the "permitted list," and none but those on this list should be allowed.

In selecting a winding rope for any given work, it is usually customary to adopt 10 as the factor of safety. This, however, is not always good practice, as better results are often obtained by adopting a lower factor of safety, which does not require that the wires be drawn to such a high breaking strain. The higher the breaking strain the harder becomes the steel, and the wires composing the rope tend to harden in work; consequently, a rope of hard steel wires with a high initial breaking strain may fail through the wires becoming brittle and breaking.

In the planning and arrangement of a coal mine where the mules are kept underground, much care should be taken to place the stables in such a location that the sanitary conditions of the mine are not affected. It is always unwise to lead the entire intake air-current through or past the stables. It is best to split the current and after sending some air through the stables, lead it directly to the return air-way by means of a large wooden pipe or overcast. This prevents the contaminated air from the stables being supplied at the faces where the men are working.

The forestry service of the Geological Survey has compiled statistics showing the amount of timber used in the coal mines of Pennsylvania during 1905. The tabulated results show that 121,565,000 ft. b.m. of sawed timber valued at $1,842,000, or $15 per M., were used. Of round timber, 52,440,000 cu.ft., valued at $3,468,000, or $6.60 per 100 cu.ft., were used. The total quantity of timber used equaled 8½c. per long ton of coal mined. Yellow pine furnished one-half of the round timber, while hemlock holds first place in quantity of sawed timber used.

At no place in the management of a mine is mistaken economy so often applied as in the neglect of a proper system of ventilation. The operator who considers an adequate ventilating system to be merely one that will carry away gases and prevent explosions is taking a narrow view of the subject. The greatest harm resulting from an insufficient supply of pure air is soon shown in the behavior of the men. Surliness, discontent, inefficiency, and a general desire to cut work or quit early are often directly traceable to bad air. It is as reasonable to expect healthiness, happiness, and industry from the occupants of unsanitary tenement houses, as to calculate on having a contented, hard-working lot of miners in a poorly ventilated mine.

The German government and colleges have been spending much money and time in investigating and attempting to construct a satisfactory device to be used in life-saving work at collieries. The only kind of rescue appliances which are being considered are of the portable oxygen apparatus type, and notwithstanding the many years study devoted to the subject, there has been no safe and appropriate apparatus devised. This is proved by the death of two rescuers who were supplied with the most modern life savers at the Courrières mine. When it is conclusively shown that the existing apparatus has been made suitable, practical, and safe, there is little doubt that the government will then adopt and issue compulsory regulations governing the subject, which will be followed by similar action in other countries.

Much interest has lately been evinced in attempting to use electricity as a heating agent to replace coal. At present, however, our knowledge and methods are not sufficiently advanced to enable us to produce electricity cheap enough to permit of its actual competition with coal as a heating agent. The thermal value of 1 kw.-hour of electricity is 3412 B.t.u., while a pound of coal may be rated at from 12,000 to 14,200 B.t.u., with an efficiency in available heat of about 61 per cent. It is therefore evident that it requires from 2 to 2½ times as much electricity as coal to produce a given amount of heat. If we consider, therefore, that anthracite coal costs $7 per ton delivered, electricity would have to cost about .14c. per kw.-hour, or $9.19 per h.p. per year, a figure below the possibility of production by a central station.

Calking joints for hub-and-spigot cast-iron gas mains with melted lead is attended by many difficulties, especially under certain conditions, such as occur when the pipes are partly submerged. As a substitute for melted lead, the use of lead-wool is coming into use. This material is lead which has been shredded to about the size of heavy thread, and collected into bundles of suitable size. This lead-wool is calked cold into the joint against a backing of hemp or tarred yarn. It is claimed that molten lead contracts on cooling, and thus leaves a space free to leak. Moreover, it is argued that the yarn in the joint is not compressed sufficiently when the calking is molten lead. With lead-wool there is more yarn and less lead used than with a poured joint. Furthermore, in locations where gas is leaking badly, it is dangerous to bring any highly heated substance near for fear of explosion or conflagration.

It is wrong to believe that a hoisting rope will always conform to, and corroborate rope formulas. Many well made ropes have failed after two or three weeks' service, even though they were not worked at more than one-tenth their safety factor. Some ropes have broken at their largest section, and their theoretically strongest part. One 1½-in. rope broke from its own weight without the cage. These instances have led to an abandonment of the "area of full section" theory, as well as lessened the belief in the "added area of each wire" theory of rope strength. A rope should not be considered as a solid bolt, nor as a number of rods in a spiral bundle; nor is it correct to believe that the decreased strength of the rope is due to surface wear only. Practice shows that the greatest factor of weakness is due to the brittleness of the wires owing to reversal of stresses. If broken wires are examined, it will be noticed that most of them are nearly full section, while if the break were due to tensile action, the wire would be pulled to a fine point.

Metallics.

Up to July 5 only 75 coolies at Johannesburg had applied for repatriation.

The smelting charge on the tin concentrate purchased by the Mount Bischoff Company, of Tasmania, from outside producers is £4 per 2240 lb. of ore.

In the timber works required around mines, mills and smelters, mortising, tenoning, scarfing and other fancy carpentry is generally not merely a waste of time and money, but also of strength. Butt joints, secured by dowels drift bolts, or spikes toe-nailed in, furnish both the easiest and strongest construction.

In the construction of ore bins, while attention is concentrated upon providing sufficient strength in the bottom and exterior walls, it is frequently forgotten that the interior partitions must be made as strong as the exterior walls, because if one pocket be empty, while the next one is full, there will be the same pressure exerted in that direction as externally.

Roughly, rock and ore crushed to about 1½-in. size weigh about 55 per cent. of the same material solid. The weight of a cubic foot of water, approximately 62.5 lb. (⅝ of 100 lb.), is easy to remember. A mineral of 4 specific gravity, like zinc blende, consequently weighs $4 \times 62.5 = 250$ lb. per cubic foot when solid; and about $4 \times 62.5 \times 0.55 = 137.5$ lb. per cubic foot when broken.

The installation of the Huntington-Heberlein process at the Trail smelter, British Columbia, is said to have nearly doubled the lead-producing capacity of that plant. Whereas formerly it was possible to produce only 290 bars of work lead in an eight-hour shift, the output is now 520 bars. This confirms the results of the experience reported from other works where this process has been installed.

It is well established that the Huntington mill is a satisfactory pulverizer for material not too hard, and not too large in size. It is largely used as an accessory to other crushing machinery, and for regrinding tailings and middlings. Of late years the weight and strength of the various parts of the machines have been increased, and important improvements in the construction of details have been made.

Ordinarily a laborer, unloading coal from a gondola car, over the side of which he has to shovel the coal, will handle 25 tons in a day of 10 hours. At $1.50 per day, the cost is, therefore, 6c. per ton. However, on a contract he will unload the carload in considerably less than 10 hours, and 5c. per ton will generally be found a fair remuneration when the rate for ordinary labor is $1.50 per 10 hours.

The Washoe smelting works, at Anaconda, Montana, during 1905 treated 7000 tons of ore daily, of which the output of copper was 500,000 lb. The average monthly output of these works was 15,000,000 lb. of copper, $95,000 of gold and $432,000 of silver. The monthly pay-roll amounted to $215,000, the average number of men employed being 2450. The consumption of coal was 600 tons daily, of coke 400 tons and of lime rock 1600 tons.

The application of the bucket dredge to the exploitation of alluvial tin deposits in Tasmania does not appear to have been entirely successful, the chief obstacle being the timber in the drift and the boulders, which make the bottom irregular, while moreover the tinstone occurs in a state of fine division, wherefore it is not easy to save it all successfully. Although the bucket dredge can work per cubic yard considerably cheaper than the pump dredge, the latter appears to be the more successful.

The pipe system, which serves to supply compressed air to the various stations for the use of the locomotives in the plant of the Washoe Copper Company, is composed of pipes varying from 6 in. to 2 in. in size. Even at the high pressure of 800 to 900 lb. per square inch it has developed practically no leaks. The air is furnished by two four-stage compressors, having cross-compound steam cylinders, equipped with Corliss valve gears. The compressors are provided with automatic regulators to insure constant high-pressure air.

Hot ore from a drier should not be delivered to a rubber-belt conveyor or elevator, because the rubber of the belt, when heated by the ore, is greatly reduced in durability. In a certain mill, where Blake multiple jaw crushers were used, the ore from the drier reached the crushers too hot, causing the rubber buffers of the crushers quickly to lose their resiliency and mash out into useless lumps. If hot ore must be elevated or conveyed use a Gandy or Leviathan belt, but if it be very hot, all-steel apparatus must be employed.

A troublesome accident, which sometimes happens in untimbered incline shafts, is fall of rock from the roof, between trips of the skip, which may cause the latter to jump the track. Occasionally this results in a fatality, when men are being hoisted, as not long ago at the Quincy mine, Lake Superior. The only simple way of preventing such accidents is to keep a careful watch of the roof, detailing a man especially to that work, his duty being to knock down any loose pieces which may develop. However, if the roof is badly of this character, it is likely to be cheaper in the long run to put in light sets of timber and a large lagging overhead..

In a fissure vein outcropping down a mountain slope so that it can be entered by adits on the vein, it does not follow that because ore is cut by the lowest adit, perhaps 1000 ft. vertically below the uppermost, that the lowest will continue to encounter ore as it goes into the mountain. On the contrary it is rather to be expected that, because of secondary enrichment after the mountain slope was formed, the pay ore will be confined to a zone more or less parallel with the mountain slope, and as the adits are driven into the mountain they will pass through that zone and find the vein poor. This cannot be laid down as a general rule, but nevertheless it is a rather common experience.

The cost of a horse-power developed in steam plants ranges from $25 per annum, reckoning 300 days running and 24 hours per day, upward; depending chiefly upon the cost of coal, type of engine, and size of plant. To attain the low figure of $25 per annum, it would be necessary to have coal of 15,000 B.t.u. at $1 per ton, while the plant would have to be of approximately 1000 h.p., and be equipped with compound condensing engines. In mining and metallurgical plants of the West, in plants of 400 or 500 h.p. and single-expansion engines of ordinary good designs, the cost of a horse-power is $60 to $75 per annum. In plants of 50 to 100 h.p., about $90 per annum, or 30c. per day, can safely be reckoned.

In the last report of the Burma Ruby Mines, Ltd., the directors complain that the prices of their stones never go up, although those of diamonds do; but the fact is the corundum and spinel group are not in demand by the multitude. The blue sapphire is not popular as an ornament, as it shows up badly in artificial light, and there is not one man or woman in a million that could confidently identify a real ruby. Besides the ruby has been the victim of the cheap substitute, and the jewelers' shops are flooded with so called rubies, which are either spinel or garnet. The average wearer of jewelry will not pay a high price for a true ruby, even if every onlooker may honestly assess its value at a dollar a carat.

Gas firing in connection with steam boilers has frequently been tried, but so far does not appear to have proved economical, although there is no clear reason why it should not be economical, in large installations at least, in view of the common utilization of blast-furnace gas for firing the steam boilers in connection with iron blast furnaces. Indeed, it is argued that it would be more economical to fire such boilers with producer gas than with blast-furnace gas, because of the more regular supply of gas that could be thus obtained. Forced draft, with hand firing, is better than hand firing with natural draft, but is not as efficient as gas firing. The mechanical stoker avoids the cooling due to frequent opening of charging doors involved in feeding coal by hand; but it is impossible to push the stokers beyond a certain speed, so that, except in the amount of labor required, the machine is considered by many engineers to have no particular advantage over hand firing with forced draft for the rapid raising of steam in an emergency.

THE ENGINEERING AND MINING JOURNAL

Contents.

	PAGE
Editorials:	
The Sulphur Industry	213
Greed vs. Common Sense in Coal Mining	214
The Metal Market in July	214
The Use of Pyrometers in Ore Roasting. *William E. Greenawalt*	193
Lode Lights. *E. Hibberd*	193
*Mining in Colombia. *Henry G. Granger*	194
A Unique Discovery at Cobalt. *J. J. Bell*	195
A Novel Repair Job. *Reginald Meeks*	195
*Ore Shoots. *Walter Harvey Weed*	196
Matte Converting. *Hiram W. Hixon*	197
*Mining at Tonopah. *Claude T. Rice*	199
*Butte, Montana. *W. Spencer Hutchinson*	200
*The Robinson Gold Dredge	201
*Silver King Mill, Park City, Utah. *Staff Correspondence*	202
*A Simple Device for Separating Sands from Slimes. *Courtenay De Kalb*	206
Alcohol in Industry	206
An Experimental Colliery. *Henry Briggs*	207
Coal Compression in Coke Manufacture	208
Deep Coal Mining. *George Farmer*	209
Colliery Notes	211
Metallics	212
Correspondence and Discussion:	
Petroleum Refining. *W. Scott Lysle*	215
A Peculiar Mine Gas Test. *Sidney Fry*	215
Notes on Cobalt, Ontario. *Walter Harvey Weed*	215
The Passing of Iron Mountain	216
Wrought Iron in Great Britain	216
Questions and Answers	216
Personal	217
Obituary	217
Societies and Technical Schools	218
Industrial	218
Trade Catalogs	218
Construction News	218
Special Correspondence:	
San Francisco	219
Salt Lake City	219
Denver	219
Duluth, Minn	219
Platteville, Wis	220
Scranton, Penn	220
Indianapolis	220
London	221
General Mining News	221
Foreign Mining News	224
Markets	225
Prices of Chemicals and Minerals	232
Dividends of Mining Companies	233
The Mining Index	234-240

*Illustrated.

The Sulphur Industry.

An agreement has at length been arrived at between the sulphur producers of Sicily and the Anglo-Sicilian Sulphur Company, so that there is nothing now in the way of an arrangement for the regulation of the output between the Louisiana producers and the Italian Government. This is a matter which has been hanging fire for a long time.

Our readers will recollect that for 10 years the English company has acted as a regulator of the Sicilian output, with profit to both parties at the expense of the consumers, although probably no one will grudge any benefit which the Sicilian miners may have derived. There is no doubt that the contracts would have been renewed between the company and the producers, had it not been for the appearance in the market of the Louisiana sulphur. For a long time the Italians were skeptical with regard to the possibility of American sulphur, and doubted the claims of the Union Sulphur Company, exploiting the Frasch process; but as their sales to America dropped year by year, dwindling to an insignificant amount in 1905, they could no longer doubt the seriousness of the new competition, especially in view of the reports of the technical men, including Signor Baldacci, whom they sent to the United States to investigate the conditions. The chief producers of Sicily became in fact almost panic stricken, and finally convinced themselves that nothing short of the co-operation of the Italian Government and the compulsory amalgamation of the entire Sicilian sulphur trade would preserve the industry from ruin.

Consequently, the Anglo-Sicilian Sulphur Company found itself out in the cold, and its services not required in the future. All it could do was to make the best bargain with the Italian Government for the realization of its stocks, and go out of business. The bill for the formation of the Consorzio, or Government committee for the regulation of the trade, has passed the Italian parliament, and now requires only the endorsement of the Senate and the royal assent, both of which will surely be given. The shareholders of the English company have accepted the terms arranged by the directors, so that no trouble will arise from this source. The course is therefore clear for an agreement between Italy and Louisiana.

It must be admitted that the fate of the Anglo-Sicilian Sulphur Company is a case of hard luck for those who invested in its stock. Although the management and the method of finance were sound and conservative in all other respects, it is obvious that the directors made a serious mistake in sinking their profits in accumulating stocks of sulphur. As things have turned out, they will not receive for these stocks more than three-quarters of what they paid for them. Although their policy was formulated at a time when there appeared to be no possible outside competition from America or elsewhere, it was a gross error of judgment to ignore the possibility of such competition, especially in view of the fact that the Louisiana deposits were known to be large even before the Anglo-Sicilian Company was organized. Evidently the repeated failures in the early attempts to work them clouded the judgment of the directors of the English company, and when it was announced that the Frasch process was a success they regarded it as only one more cry of "Wolf."

As it is, the company now finds itself saddled with about 400,000 tons of sulphur, on which it has spent £1,200,000, having purchased it partly out of capital and partly out of accumulated profits. Under the new regime, the company could take no hand in the realization of these stocks in any way that could be called businesslike, and the only policy was to fight for the best terms obtainable. The terms finally agreed upon are that the Consorzio purchase the stocks at the rate of 59 lire per ton. Payment is to be made in bonds guaranteed by the Italian Government, bearing interest at the rate of 3 2/3 per cent., and redeemable in 12 annual drawings. In this way the shareholders in the company will eventually receive back practically the whole of the nominal capital. It is distinctly an example of the inadvisability of locking up such a large proportion of the reserve funds in the business itself.

The whole affair is one of the most remarkable occurrences in industrial history, and in so far as the Anglo-Sicilian Company is concerned, it might be cited as the sad fate of a trust; at least it is instructive in showing how an apparently secure trust may meet with disaster. American consumers have had to pay, since 1896, an advance of $3 to $7 per ton on their sulphur; but while it may be no consolation to them, at all events they

will be interested to know that the trust, which has paid dividends to be sure, did not finally bag all of the profit. The extraordinary developments in connection with this business are by no means at an end, inasmuch as the entrance of the Italian Government into a compact by which it undertakes to regulate the output of private producers introduces into industrial economics an experiment which will be watched with interest. In effect it becomes the principal in dealing with the Union Sulphur Company, the middleman having been eliminated.

Greed vs. Common Sense in Coal Mining.

The investor who puts his money in a mining enterprise not only expects quick returns, but also looks for a higher rate of interest than he would in investments of a less speculative nature. The mining industry is so enveloped in a halo of misconception, that sober, careful thought seems misplaced, and although the competent mine manager or superintendent knows very well the labor and time required to bring a property to the dividend point, the public, who are generally ignorant of mining conditions, form the bulk of stockholders, and their impatience at any delay is the bane of a mine manager's life.

Although coal mining is not accompanied by the same uncertainty which is attached to metal mining, nevertheless the proceeds depend to an equal degree upon the efficiency of the management and its methods. However, to consider him the most successful manager, who can ship coal with the least initial expenditure, is an incorrect idea. One superintendent lays heavy steel on his main haulway, while another uses light iron; the former hauls his trips faster and soon pays for the heavier rails, while the latter handicaps the entire output of the mine. Again, one superintendent drives all entries on water level, and consequently crooked, losing much coal because of the irregular pillars left; while another will lay out his workings in such a way as to secure the maximum profit that is possible.

Probably the greatest mistake is, first, to dispense with the services of a competent engineer, or surveyor, and, second, to attempt to rob the pillars on the advance work. It is impossible in a short space to deal even briefly with the multitude of complications arising when entries and rooms are not driven on centers and carefully surveyed and mapped; holing through problems come out wrong, bore holes are mislocated, places run together, and squeezes result. Certainly there is no economy in developing a property without a well considered and carefully defined system. The second fault is as important, if not more so, than the first. In this connection, we refer particularly to getting out pillars while the entries are still advancing. In only one instance can a method of early robbing be successful and that is when the panel system is used. Otherwise, serious damage often accrues to the whole mine through squeezes and cave-ins, besides permanently injuring roadways that may be much desired in later development work. We have in mind one mine which changes superintendents about every six months, a policy which is due entirely to unreasonable stockholders. One superintendent, on taking hold, finds no narrow work advanced and all rooms worked out; so going ahead and advancing his entries, running up large yardage costs, he is dismissed because of extravagance in management; the succeeding superintendent comes on and taking advantage of the narrow work his predecessor has driven, works only rooms and wide work, making an excellent showing for several months, but then he too has to go. Here the fault is distinctly blameable upon a weak-minded board of directors, which lacks the knowledge and backbone to lay out a broad policy of development and stick to it; the unfortunate superintendents have to pay for the sins of omission of the directors.

The British are more patient than Americans, and generally develop their mines to the limit of the property and get everything on the retreat. This does not bring returns so quickly, but leads to greater earnings, larger percentage of coal extracted, and less timber and iron lost in the end. At least one advantage resulting from the consolidation of large coal interests that has recently taken place is to do away with much of this careless mining and carry on development work as it should be done.

The Metal Market in July.

During July the metal market was generally quiet, but nevertheless it displayed some interesting fluctuations. The reaction in the price for copper, which began in June, continued in July, the price for electrolytic declining to 18@18¼c. This movement was due to the retirement of the consumers from the market, especially the domestic consumers, whose nearby requirements had been well supplied. There was nothing to indicate weakness in the general situation, and producers mostly were confident that there would be sooner or later a return to the former position, which in fact occurred toward the end of the month, under the stimulus of increased buying, although the market is yet only moderately active. It closes at 18¼@ 18⅜c. for electrolytic. The average price of Lake copper in July was 18.585c.; of electrolytic, 18.190 cents.

The price for desilverized lead remained steady at 5.75c., New York, throughout the month. This is the settling price fixed by the American Smelting and Refining Company, which controls the major part of the lead production of the United States, while moreover its settling price is adopted by the other large producers. Early in July there was a shortage in the supply of lead for immediate delivery, leading to the importation of some foreign lead, which sold at a premium; indeed, as high as 5.90c., New York. This condition disappeared as the month progressed, and toward the end foreign lead was sold at a discount. However, these transactions are comparatively insignificant, the great bulk of the domestic consumption of lead being made under contracts based on the settling price of the American Smelting and Refining Company.

The price for spelter, in which metal there are large speculative interests, fluctuated only within narrow limits during July. It opened the month at 5.82½c., St. Louis, rose to 5.90c. in the latter half of the month, and then fell to 5.85c., closing at 5.87½c. The smelting business has been prosperous, there having been an abunddant supply of ore and a satisfactory margin between the price of spelter and the price of zinc in ore. The average price of spelter for the month was 6.006c., New York; 5.856c., St. Louis.

IN THIS NUMBER we publish the "Mining Index" on the same lines as it was formerly prepared for the *Mining Magazine*, which has been consolidated with the JOURNAL. This index is a complete reference to the mining and metallurgical literature, month by month, and hereafter will appear regularly in the JOURNAL, first issue of each month.

Correspondence and Discussion.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by artcles appearing in the columns of this JOURNAL.

Letters should be addressed to the Editor.

We do not hold ourselves responsible for the opinions expressed by correspondents.

Petroleum Refining.

Sir—In 1904, I was called upon to report on the removal of water from a heavy petroleum, the result of which may be of interest to the readers of the JOURNAL.

The petroleum was very heavy and viscous, being in the neighborhood of 15 deg. B., it being necessary to run steam pipes down the wells in order that a maximum production could be obtained. On distillation the oil yielded only about 10 to 12 per cent. of distillate, the residue carrying a large amount of occluded water.

The first experiment was made by placing a 3-in. pipe (one side of which was perforated with 1/16-in. holes) on the bottom of the still, which was mounted similarly to a steam boiler, and forcing compressed air through the bath. This, however, proved a failure, as the air rapidly found its way to the sides, and did not pass through the oil.

In the second experiment, short stand-pipes were placed in the upper side of the 3-in. pipe, which resulted in an improvement over the first installation, but was far from being satisfactory, as the bath foamed badly, and considerable heavy residue was carried into the cooling coils, which rapidly clogged them.

The third experiment was conducted in a flat-bottom, rectangular tank, a number of 3-in. pipes being placed along the bottom, these having stand-pipes the same as in experiment No. 2, and the results obtained were very gratifying, as foaming was reduced to a minimum.

The air was at first supplied to the bath under a pressure sufficient to create a lively agitation, but this caused excessive foaming, and was later reduced to a tension just sufficient to overcome a pressure produced by a column of the liquid equal to the depth of the bath of oil, it being necessary to increase the pressure as the bath became more viscous. The attempt was made to remove as much as possible of the distillate, the remainder being diverted into another set of coils and the last of the distillate, together with the water, removed; but this proved to be impracticable, so the temperature was raised in order to remove the distillate and water together, they being later separated. Numerous tests showed that only a trace of water remained in the residue. The air undoubtedly caused some oxidation of the residue, but no opportunity presented itself for a study of this question, and paving contractors, who used the residue for asphalt paving, reported its quality to be superior to that not treated with air.

W. SCOTT LYSLE.

Rochester, N. Y., June 26, 1906.

A Peculiar Mine Gas Test.

Sir—In your issue of Sept. 30, 1905, appeared a letter from R. H. Emtage on a discovery of an unusual kind of mine gas. This letter interested me greatly, and as there have been no answers to the questions he asks in any of your succeeding issues, and the subject being an interesting one to mine managers generally, I wish to answer those questions at this, my earliest opportunity. In the first place let us interpret the analysis given to him by the chemist to whom he submitted it. Here we have oxygen, 14; nitrogen, 73.3, methane, 11.1; hydrogen 1.6; total 100.0 per cent., which means.

Air	oxygen.....	14	66.9
	nitrogen	52.9	
Firedamp...	methane	11.1	12.7
	hydrogen ...	1.6	
Blackdamp ..	nitrogen.....	20.4	20.4
		100.0	100.0

It is evident to me that Mr. Emtage did not get exactly the same mixture for analysis as that in which the lamp was tried, for, on making up an exactly similar mixture, it filled with flame the gauze of a safety lamp placed in it, doing this with an ordinary Davy lamp (a small one which I made for the occasion) and it was only after the addition of a considerable percentage more nitrogen that the flame was damped down to normal size.

From what is shown by my explanation of the analysis of the gas, Mr. Emtage may see for himself how it is that the flame-cap test would fail; it is simply because the individual molecules of CH_4 are kept separated by the interstitial particles of nitrogen so that not enough of them can come into contact with the flame at one time for their luminosity to show. The non-explosive character of the mixture is of course to be explained in exactly the same way.

Then as to the percentage of the oxygen required to be added to the mixture to cause explosion; the 11.1 volumes of methane would require 22.2 volumes of oxygen and the 1.6 volumes of hydrogen would need 0.8 volumes or 23 volumes of oxygen altogether; but as there were already 14 volumes present, the chemist evidently added 22.2 — 14, or 8.2 per cent. About 5.1 per cent. of this would mix with the 20.4 per cent. of nitrogen to form air, and the excess of 3.1 per cent. of oxygen would certainly go toward making a more violent explosion in the endiometer than would be given by a mixture with air alone.

An addition of air does not cause the same result, as I found by experiment, but the burning of the gas is hastened by it, the speed of the burning being increased up to a certain point at which the air suffices for complete combustion; from that point, as the percentage of air is increased, the rate of burning decreases till at last at a certain point the mixture refuses to ignite.

SIDNEY FRY.

Westport, New Zealand, May 12, 1906.

Notes on Cobalt, Ontario.

Sir—The Cobalt district of Ontario, whose marvelously rich silver-cobalt veins were discovered two and a half years ago, continues to surprise its friends and to meet the expectation of the geologists who predicted its brilliant career.

A week ago, a vein of solid native silver and dyscrasite (Ag_6Sb) 11 in. across in places, and averaging half that width, was uncovered on the Jacobs property on Kerr Lake, 2½ miles east of the town, and a couple of days later, a second vein, about half as wide, was discovered and its surface exposed on the same property. These discoveries probably add half a million dollars to the value of an already valuable and productive property. This discovery shows how easy it is to overlook a vein, even when the ground is carefully trenched in prospecting.

The district is an undulating one of rocky drift-covered hillock, with intervening lake and marshes. Prospecting is extremely difficult; aside from the dense growth of timber and vegetation, the exposures of rock in place are few and of small extent. Prospecting is carried on blindly by digging trenches in the drift until bed rock is exposed, and then searching every crack and crevice for cobalt bloom. In the discoveries just noted, the trench showed a mere knife-blade crack, yet a few feet away it widens to 6 in. and is filled with solid silver and, in places, rich argentiferous smaltite worth $600 to $3000 per ton. When one considers the possibilities of a 20-acre lot in a district where such veins may be but a few yards apart, it is enough to make the most pessimistic individual enthusiastic. Moreover the discoveries now cover a considerable area, and cobalt ores, more or less valuable, are known for 30 miles north and 30 miles south of the town. It is probable that the district is still in its infancy, and, with such enormous prizes, prospecting is carried on with feverish activity.

The new mining laws differ so materially from American practice that they should be noted. At present anyone can prospect ground not "passed" by the inspectors. The prospector who finds "valuable mineral in place" can put up his stake on the discovery and then has 15 days to file his claim. It is then examined and sampled by the provincial inspector and, if he decides the ore is valuable, the claim is passed and the title becomes valid. If not, the ground is thrown open

again to any and all prospectors. About 90 per cent. of the recent locations have been thrown open. This puts a premium on work, stops a rich man or corporation from staking out the whole district, and is generally regarded as a good law.

It will be seen, however, that with veins whose apexes may be mere cracks, and which are seldom continuous for more than a hundred yards or so, while containing such rich ores, the returns for prospecting are enormous and immediate. A single valuable vein, however, gives possession of 20 acres.

In the adjoining timber grant (a berth), the Government has not allowed prospectors to stake claims, and, having reserved the ground, is now engaged in a bit of paternalism. Professor Miller, provincial mineralogist and the father of the camp, being the first one to recognize and call attention to its value, is now in charge of a corps of men dividing up the reserve into 20-acre lots and prospecting them, it being understood that the Government will either work or lease the veins thus discovered. Valuable veins have already been found and may add greatly to the income of the province.

A decision rendered a few days ago in the Hargreaves case adds several valuable claims to the Government's holdings. A student at Queens University, after talking over the geology of the district with Professor Miller, filed application for seven claims, asserting the discovery of valuable ore. It is said that one of the professors at the University made oath that the student was at the college at the time that the discovery was alleged to have been made. He visited the district later, his claim was allowed, and was then transferred to a company which proceeded to develop the claim and did discover valuable ore. The court has decided the location fradulent, and the province will hold and work the claim, and will reimburse the innocent company for all actual expenditure.

The list of producing mines is already large. At the top is the Nipissing company, said to be controlled by International Nickel interests. The mine has yielded $1,250,000 of ore in one year at a mining cost of $80,000. The company owns 840 acres in the heart of the district, taken up under the old laws and, of course, largely unprospected.

The Jacobs, University, La Rose, Trethewey, O'Brien, Foster, Drummond, Silver Leaf, Silver Queen, and Buffalo are producing; the Violet, Red Rock, Silver Star, Petersen Lake, Silver Cliff, Silver Bar, Rothschild and Watt are developing.

The properties are all held at high figures, $250,000 being about the lowest price mentioned for any property with known ore. The Petersen Lake Company is said recently to have paid $200,000 to the Government for the right to operate under that title, although no veins are known there. It is evident that, at this date, no other district known in Canada offers as good a chance to the prospector.

H. W. A.

Cobalt, Ont., July 15, 1906.

The Passing of Iron Mountain.

A bit of history is involved in a recent meeting in St. Louis, where the stockholders of the Iron Mountain Company voted to dissolve the corporation for the reason that it "has not been actively engaged in business operations for a long time past, and has no indebtedness; and the aggregate value of the assets has been reduced, by depreciation in the value of its real estate, to a small percentage of its capital stock of $3,600,000." The court has since granted the petition to dissolve, and appointed V. Reyburn, I. G. Steedman and Montague Lyon, of St. Louis, trustees to wind up the company's affairs.

The Iron Mountain Company is about contemporaneous with the JOURNAL, having been organized 40 years ago. The iron ore deposits of Iron Mountain and Pilot Knob, 80 miles southwest of St. Louis, were the basis. These were believed to be large enough to make St. Louis the rival of Pittsburg, and to supply the iron industry of the United States for an indefinite time. They were sufficient to secure the building of the St. Louis & Iron Mountain Railroad, which has since become part of the chief line from St. Louis to the Southwest; the construction of blast furnaces at Carondelet, a suburb of St. Louis; and the establishment of large iron works.

As work proceeded, however, the Iron Mountain proved to be only a surface deposit, which was gradually worked out. Much exploration failed to show anything of value in depth, and finally the mines were abandoned. The flourishing mining town of Iron Mountain dwindled down to a small village. For years the output of ore was insignificant, and for some 10 years past it has been nothing.

The company was honestly managed, and in its palmy days, the stockholders received over 200 per cent. on the par value of their shares in dividends. The remaining assets include 12,000 acres of land; two granite quarries which are worked under leases; and about $160,000 in cash and securities. It is understood that arrangements have been made to sell the quarries and the land, and the purchaser of the latter will turn the greater part into a large stock farm. The output of the once famous Iron Mountain tract will be beef—not iron.

Indian steel, or "wootz," made in Persia and India, between 400 and 500 B. C., was the material of which the famous Damascus blades were produced. The method employed resembles in theory the crucible process of today.

Wrought Iron in Great Britain.

The British Iron Trade Association reports the total output of puddled or wrought bars in Great Britain in 1905 at 938,558 long tons. In 1904 it was 936,228 tons and in 1903 it was 950,393 tons; showing that in 1905 there was an increase of 2330 tons, or 0.25 per cent., as compared with the previous year, but a decrease of 11,835 tons, or 1.25 per cent., as compared with 1904. Scotland and Staffordshire are the two more important producing districts.

The output of finished shapes and forms by the mills making puddled bars was 1,116,850 tons in 1905, against 977,091 tons in 1904; an increase of 139,759 tons, or 14.3 per cent. The difference between these figures and the production of puddled bars is accounted for chiefly by the use of imported blooms, which come largely from Belgium.

Questions and Answers.

Starting a Drift Half-way Down a Shaft.

I have a shaft 200 ft. deep, which apparently passed through the vein, which should have been followed, at a point about 100 ft. below the collar, but the showing at that point was disregarded at the time. The shaft is not timbered. How shall I go about starting a drift at that point?

A. P. C.

Answer—Construct a substantial platform of 2-in. plank, spiked to 4x4-in. timbers, making the over-all dimensions of the platform a little less than the inside dimensions of the shaft. Put in a substantial eye-bolt at each corner, and suspend the platform, by slings, to the end of the hoisting cable. Lower the platform into the shaft to the desired point, and there wedge it in tight, still keeping it suspended by the cable. Cut two hitches in opposite sides of the shaft, to receive timbers to support a permanent platform. The remainder of the operation will be quite obvious.

Flat Ropes—Unit of Ore.

1. Why are flat ropes sometimes used for hoisting in preference to round ropes?

2. What is meant by a "unit" as used by smelters in making returns to sellers on the purchase of their ores?

T. E. M.

Answer—1. The flat rope is used because it can be wound upon a reel, which has greater leverage, or torque, when the cage is at the bottom of the shaft and the load is greatest.

2. A unit is 1 per cent. In referring to the ton of 2000 lb., it is, therefore, 20 lb.; in connection with a ton of 2240 lb. it is 22.4 pounds.

Most propellers are now cast with separate blades, as this method allows broken blades to be replaced. The casting and molding difficulties are likewise decreased.

Personal.

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Herbert Kilburn Scott has returned to London from South Africa.

William Mackenzie has returned to Toronto from a trip to England.

John B. Farish returned to Denver from Mexico a few days ago.

H. M. Whitney, of Boston, has returned from a visit to Cobalt, Ontario.

Franklin R. Carpenter returned to Colorado a few days ago from a professional trip to Utah.

F. J. Lee, of Helena, Mont., has returned from the Yukon and is now traveling in eastern Canada.

G. G. S. Lindsey, general manager of the Crow's Nest Pass Coal Company, Fernie, B. C., is in Toronto.

Tyndal Rynard, manager of the Vanadium Alloys Company, of New York, was in Denver, Colo., recently.

F. L. Slocum, of Parral, Mexico, has been a recent visitor in New York. He has now returned to Parral.

F. C. Bowman has been appointed superintendent of the Japan-Flora Mines and Tunnel Company, near Telluride, Colorado.

Col. Enos A. Wall, of Salt Lake, has gone to Alaska on a pleasure trip. He joined Daniel Guggenheim and party at Vancouver.

General Manager H. L. Charles, of the Bingham Consolidated Mining and Smelting Company, has returned to Salt Lake from Butte.

P. J. Donahue, of Salt Lake City, has been made consulting engineer for the Standard Copper Company, a new Bingham corporation.

H. Stewart has taken charge of the interests of the British Monazite Company at Shelby, N. C., in place of W. G. Head, who has retired.

William P. Miller, Jr., has been appointed manager for the Compañia Minera de San Andres de la Sierra, S. A., in Durango, Mexico.

E. P. Arthur, Jr., mining engineer, of Cripple Creek, Colo., has returned from a two weeks' trip to Gunnison county, Colo., on professional business.

Miltiades Th. Armas, who is engaged in the operation of mines in Bolivia, has been visiting in New York. He returned to La Paz, Bolivia, on August 2.

H. A. Guess, a graduate of the Kingston (Ont.) School of Mining, has accepted the position of superintendent of reduction for the Cananea Copper Company, Mexico.

E. C. Gardiner, formerly of Bingham, Utah, has been appointed superintendent of the Dominion Copper Company's mines in the Boundary district of British Columbia.

William McDermott, superintendent of the United Verde copper mines in Arizona, formerly United States marshal for Montana, spent several days in Butte recently.

John McKane, of New York, partner of Charles M. Schwab, and the pioneer of Tonopah, is investigating the Cobalt mining field in company with John J. Adams, of New York.

E. J. Raddatz, who for the past seven years has been superintendent of the Honerine mine at Stockton, Utah, has resigned. He has been succeeded by W. K. Murdoch, his late assistant.

Samuel M. Levy has resigned the management of the Annie Laurie mine at Kimberly, Piute county, Utah, to become associated with the National Development Company, with headquarters in Salt Lake.

J. H. Granbery, who has been for some time past a member of the editorial staff of this JOURNAL, has resigned to accept a position on the engineering staff of J. G. White & Co., 43 Exchange Place, New York.

Newton W. Emmens, of Pittsburg, Penn., consulting engineer for the Elwood Tinworkers' Gold Mining Company, of Elwood, Ind., was at that company's Silver Dollar mine, near Camborne, B. C., early in July.

H. T. Whigham has been appointed manager of the London office of the United States Steel Products Export Company, succeeding Col. Millard Hunsiker, foreign manager, resigned. Mr. Whigham takes up his duties in London in August.

Francis A. Thomson has resigned his position as superintendent of the New Western Reduction Company, Goldfield, Nev., and consulting engineer to the Round Mountain Antelope Mining Company, and will shortly proceed to Colorado.

Norman W. Parlee has resigned his position as mining engineer for the Nova Scotia Steel and Coal Company at Wabana, Bell Island, Newfoundland, and will spend a few days at his home at Apohaqui, New Brunswick, before entering into a new engagement.

On the occasion of his retiring from the management of the Tyee Copper Company's Tyee mine at Mt. Sicker, Vancouver island, British Columbia, E. C. Musgrave was presented with a valuable gold watch by the nine employees, and others resident at Mt. Sicker.

W. R. Wilson, general manager of the Imperial Coal and Coke Company, of Montreal, Quebec, which is opening up coal measures on the Upper Elk river, in the Crow's Nest Pass district of British Columbia, is now visiting the company's property.

Charles Biesel, who for some time past has been chief accountant and purchasing agent for the War Eagle and Centre Star mines, Rossland, British Columbia, has been given charge of the Snowshoe mine at Phoenix, B. C., for the Consolidated Mining and Smelting Company, of Canada.

George L. Pearson, who is retiring from the position of superintendent of the coke department of the Crow's Nest Coal Company, East Kootenay, British Columbia, was recently given a valedictory dinner at Fernie, on the eve of his leaving, to return to his old home at Newcastle, Pennsylvania.

Donald B. Gillies, president of the Tonopah Extension and Montgomery-Shoshone mining companies of Nevada, Schwab interests, and Malcolm Macdonald, one of the large individual operators in Nevada, spent a few days in Butte recently, having gone there to see Senator Clark in connection with railroad building in Nevada.

J. W. Bryant has succeeded E. C. Musgrave as superintendent of the Tyee Copper Company's Tyee mine at Mt. Sicker, Vancouver island, B. C. Mr. Bryant is a graduate of the Camborne School of Mines, Cornwall, England, after leaving which he was engaged in mining first in Cornwall, in Wales, in Nicaragua, and with the Namaqua Copper Company in Little Namaqua Land, South Africa.

William Fleet Robertson, provincial mineralogist of British Columbia, left Victoria recently with a small party of men on a trip to the Peace river country and other parts of the province through which the route of the Grand Trunk Pacific railway will most likely run. Mr. Robertson expects to cover from 1500 to 2000 miles, going up the Skeena river to Hazleton and thence on horseback or on foot, possibly returning by Edmonton, Alberta.

James Cronin, manager of the mines of the Consolidated Mining and Smelting Company, of Canada, Ltd., has resigned with the intention of taking a holiday, and thereafter giving more attention to his private mining interests. He retains his large shareholding in the Consolidated Company. W. H. Aldridge, of Trail, continues as managing director; M. E. Purcell remains as mine superintendent at Rossland, with R. H. Stewart supervising the engineering department there; while W. H. White is superintendent of the St. Eugene.

Obituary.

John S. Newmyer, general manager of the Washington Coal and Coke Company, died in Dawson, Penn., last week, aged 59 years. He was born and brought up in the coke region, where his father was an operator. He was a pioneer in the opening of the lower Connellsville region.

John G. Lanning, until recently super-

intendent of the open-hearth steel department of the Lackawanna Steel Company at Buffalo, N. Y., was accidentally killed in Boston, July 18. Mr. Lanning was concerned in the erection and operation of the first successful open-hearth plant in this country.

Thomas Gibbs Blackstock died at his home in Toronto, Ont., July 24. He had been in ill health for years, the cause of his death being Bright's disease. He was a prominent member of the bar and largely interested in mining enterprises, having been long associated with his father-in-law, the late George Gooderham, in connection with the Center Star, War Eagle and St. Eugene mines in British Columbia. An attack of typhoid, contracted while looking after mining affairs in British Columbia, was the beginning of the illness which resulted in his death. Mr. Blackstock was 54 years of age and leaves a widow and a large family.

Major F. I. Ricarde-Seaver died July 15 at Ventnor, Isle of Wight, England, in his seventieth year. In his youth he did much exploring and geological work in South America, first with David Forbes, and afterward on his own account. He was the first minister of mines in the Argentine. Subsequently he went to South Africa and did much useful prospecting and exploration in Rhodesia for Mr. Rhodes and Mr. Beit. During later years he has been known chiefly as a London city man, combining the courtly manners of a company director with an intimate knowledge of engineering and the allied sciences. In that capacity he has acted in the interests of Wernher, Beit & Co. in a great number of ways. For instance, he represented the firm on the boards of the Elmore Ore Concentration Syndicate Ltd., and Charles Butters & Co. Ltd. To him was due the suggestion that the South African magnates should reorganize the London Wall district, and should erect the palatial office buildings which now adorn this part of the city of London and provide accommodation for so many mining men and mining companies.

Societies and Technical Schools.

University of West Virginia—The trustees of this institution have voted to establish a school of mining engineering in connection with the university at Morgantown. They have instructed President Purinton to select professors and to make other preparations.

Lake Superior Mining Institute—As already announced, the twelfth annual meeting will be held in the Copper Country, Aug. 8-10. The meeting will open on the morning of Aug. 10, at the Douglas hotel, Houghton. In the afternoon the Institute will visit the Calumet & Hecla, Tamarack and Osceola mines, and in the evening a meeting will be held at Hanmet. On Aug. 9, a visit will be paid to the mines north of Calumet, and in the evening a meeting will be held at Hancock, which will be the business meeting. On Aug. 10, the Michigan Smelter and the Copper Range mines will be visited, and the final meeting held.

The circular from the secretary gives the following partial list of papers to be read:

The Geology of Keweenaw Point; a Brief Description—Alfred C. Lane, State geologist, Lansing.

Mine Sanitation—Dr. B. W. Jones, Vulcan.

Five Years of Lake Superior Progress—J. F. Jackson, Houghton.

The Iron Ore Deposits of the Ely Trough, Vermilion Range—C. E. Abbott, Hazel Green, Wis.

The titles of the other papers to be presented at this meeting will be announced later.

Industrial.

The Colorado Iron Works Company, Denver, Colorado, has lately entered orders for two impact screens for Leadville; one for Kelvin, Arizona; two for Boulder, Colorado; three for Providence, R. I.; two Dorr classifiers for Mexico; a set of Humphrey 27x14-in. rolls for Murray, Idaho; a set of the same type of rolls for Mullan, Idaho; and one 11x15-in. Dodge crusher for New Mexico.

Chisholm, Matthew & Company, of Colorado Springs, Colo., have secured a large contract for the installation of Edwards' roasting furnaces in the new Golden Cycle Mill, which is now being constructed at Colorado City. Philip Argall, of Denver, Colo., is the consulting metallurgist for the new works, which are intended to be the most modern and best cyanide plant in the United States.

The Utah Mining Machinery & Supply Company has secured an order from the Boston Consolidated Mining Company for 234 standard 8-ft. Callow settling and pulp-thickening tanks, and 78 dewatering tanks, to be used in the new concentrating plant at Garfield, Utah, the order calling for delivery by March 1, 1907. This is the largest order for settling tanks of special design ever placed by one company; the tank is the invention of a Salt Lake man, and will be manufactured by a Salt Lake firm.

The Union Portland Cement Company, Ogden, Utah, recently ordered two 1200-kw. Westinghouse-Parsons steam turbines for its plant at Portland, Utah. The turbines will operate on 175 lb. steam pressure, 27-in. vacuum, and no superheat; driving enclosed type turbo-generators delivering 480 volts at a frequency of 30 cycles to a three-phase distribution system. A 750-kw. Westinghouse-Parsons turbine is destined for the Pittsburg Reduction Company's plant at East St. Louis, Ill., operating non-condensing on a steam pressure of 150 lb.

Trade Catalogs.

Receipt is acknowledged of the following trade catalogs and circulars:

Wickes Brothers, Saginaw, Michigan. Cement Shingle Machinery. Pp. 16, illustrated; paper, 6x9 in.

Joseph Dixon Crucible Company, Jersey City, N. J., Dixon's Graphite Brushes. Pp. 12, illustrated; paper,, 3½x6 in. 1906.

Wellman-Seaver-Morgan Company, Cleveland, Ohio. Bulletin M. 101. Akron Crushing Rolls. Pp. 8, illustrated; 6x9 in. Bulletin M. 102. Copper Blast Furnaces. Pp. 4, illustrated; 6x9 in. July, 1906.

Abbe Engineering Company, No. 220 Broadway, New York. "Pulverizers our Specialty." Pebble Mills, Laboratory Mills, Jar Mills, Tube Mills, Crushers, Crushing Rolls, etc., etc. Pp. 96, illustrated; paper, 6x9 in. July, 1906.

Construction News.

Rye Valley, Oregon—The Gold Coin Mining Company will rebuild its stamp mill, which was recently destroyed by fire. F. W. Ayers is part owner, and in charge of the property.

Metalline District, Washington—Louis Larsen will install a 500-ton concentrating plant in Metalline district. He has selected and had ground surveyed in close proximity to the Mammoth mine and will start on the construction of the building inside of two months. Address Colville, Washington.

Camborne, Lardeau District, British Columbia—The Elwood Tinworkers' Gold Mining Company, of Elwood, Ind., has let a contract to the Crawford Double Rope Aerial Tramway Company, of Nelson, B. C., for the construction of an aerial tramway at its Silver Dollar mine near Camborne, B. C. The right of way for the tramway has been cleared; construction work on the company's stamp mill and flume and pipe line is proceeding; the installation of an air compressor is in progress, and machinery and plant is being received at the mine.

Windy Arm, Yukon Territory—The aerial tramway built by the Riblet Tramway Company, of Spokane, Wash., lately completed, from the shore of Windy arm, a distance of 3¾ miles to the Conrad Consolidated Mines Company's Montana group of mineral claims, situated 3000 to 4000 ft. higher than the waters of the arm, has one span between towers of 2960 ft., which is said to be the longest span of any aerial tramway in the world, the next longest known being 210 ft. shorter. Another Riblet tram, from Windy arm to the J. H. Conrad Bonanza Company's Venus mine is almost ready for operation. Surveys for other tramways in this neighborhood have been made and construction will be proceeded with the ensuing fall.

Special Correspondence.

San Francisco. July 25.

An assignment of the Nevills-Rawhide Mining Company's property at Rawhide, near Jamestown, Tuolumne county, to George W. Ade as trustee, has been placed on record, the document confessing an inability to pay the debts of the company at the present time. The trust is to terminate when the company can meet its obligation. The assignment comes somewhat as a surprise to many who supposed that Capt. W. A. Nevills, who finally came into possession of the famous mine after much litigation with his partner, was doing well. The truth is, however, that the Rawhide has never been profitable since Capt. Nevills became the sole owner under the corporate name mentioned. It has been a very large producer in the past, but needs new machinery, a new shaft, and other things to be brought to its old paying stage. Mr. Ade, the trustee, is also receiver for the Copper King, Ltd., of Fresno county, and was probably put in the position by men of that county to whom the mine is indebted. At one time, not many years ago, the Rawhide was considered one of the most valuable mines in the State.

The State Anti-Debris Association has filed charges of contempt against the Polar Star Mining Company of Dutch Flat, Placer county, alleging that the mine has been leased to others who are violating the injunction against mining the ground by the hydraulic process issued some time ago. This is the Nichols property over which there has been so much litigation and controversy. A debris dam was built, but the anti-debris people contended the law was not complied with; injunctions were issued, and the mine closed. At one time the California Miners' Association started to make a test suit as to this property to see whether or not the issue of a license to hydraulic by the Debris Commission under the Caminetti law, was final, but on the advice of attorneys the matter was dropped, and Mr. Nichols carried on the litigation himself, without the assistance of the Association.

The Board of Trade of Bakersfield, Kern county, has taken up a new line of work for such organizations, by its members making personal visits in a body to the mining districts of the county, in order to see for themselves what is being done. The first district to be visited was Amalie, where a number of mines are being opened and equipped.

A proposition is made by the Debris Commission to dredge the Yuba, Bear, Feather and Sacramento rivers where it is needed. Now that the barrier has been built in the Yuba and preparations have been made to build in the Bear, the channels below these dams can be dredged and will stay clear.

A railroad will probably be built up Pit river from a junction with the Southern Pacific near Kennett to De La Mar, Shasta county, where is the Bully Hill mine, a distance of 17 miles. D. M. Riordan, general manager of the Bully Hill, which is controlled by the General Electric Company, says that he has recommended to his company that construction work be commenced at the earliest possible date. Unfortunately, however, data obtained from surveys already made were lost in the San Francisco fire. This makes it necessary to make new surveys.

Arthur L. Walker, construction agent for the Guggenheims, has let a contract to the Healy-Tibbetts Construction Company, of this city, to grade 350,000 sq.yd. of space for the buildings of the new smelter to be erected at San Bruno point on the bay shore about 13 miles south of San Francisco. The site is at the edge of deep water, and the tracks of the Southern Pacific Company are close by. The wide expanse of San Francisco bay is to leeward of the plant, with the prevailing winds in this vicinity, so no trouble is anticipated from fumes.

There is a prevailing scarcity of skilled miners in most parts of the State and particularly in Shasta county, where several large copper and gold properties are being worked. Nearly all these important mines are running short-handed and have standing orders for the more experienced workers, such as machine men, timber men and drillers. Muckers and outside men are plentiful.

There is some little excitement over recent discoveries in Morrow Mining district, 24 miles north of Barstow and in the vicinity of Coolgardie, San Bernardino county. Considerable coarse gold has been taken out in dry washing and quartz carrying free gold has also been found. A number of prospectors have gone to the field.

There is some little excitement at Chorro, San Luis Obispo county, over a find of $30 ore in the mine owned by Burdetts, Chandler and others. The ledge was found at a depth of 125 ft. in the shaft. There is a small mill and hoist on the property.

The old Oriental quartz mine near Alleghany, Sierra county, is again in bonanza. The new find of rich ore is west of the old shaft and in ground heretofore unprospected.

Salt Lake City. July 27.

For many months past government officials have been in this State investigating alleged land frauds, and it is stated that they have found sufficient grounds upon which to bring criminal prosecutions. It is claimed that titles to coal lands in Carbon and Emery counties has been obtained unlawfully, and that men who have stood high heretofore in business and political life are involved in the transactions. It is said the first complaints will be filed against officials of the Pleasant Valley Coal Company, as well as parties who acted as agents of that corporation. A batch of complaints has been sent from the Interior Department at Washington to United States District-Attorney H. E. Booth, at Salt Lake, to be sworn to and given over to the proper official for service. It is likely there will be sensational developments.

The Utah Apex Mining Company, operating at Bingham, has increased its capital stock from $2,500,000 to $3,000,000. Shareholders recently authorized a bond issue of $500,000. It was proposed to subscribe to one-fifth of the issue, the proceeds to be used for development and equipment purposes.

Denver. July 29.

In the United States District Court in this city, nine separate suits against the Stratton's Independence and its lessees have been filed by the Portland Gold Mining Company on account of alleged wrongful extraction of ore. One of these suits, for $195,000, has been brought against the company, the other against eight groups of lessees, although the company has been made a party defendant in each suit. The whole amount claimed aggregates about $350,000.

The directors of the Camp Bird Company have decided to expand $350,000 for the construction of a new mill and other necessary improvements.

Another large party of Eastern stockholders of the Monarch Mining Company visited Colorado last week and were shown around by T. S. Waltemeyer, the president.

The Dupont Powder Company, which has a high-explosive manufacturing plant in course of construction at Sedalia, Colo., has decided to build a black-powder factory near Pueblo, and preliminary arrangements are being made.

Duluth, Minn. July 29.

Iron-ore shipments for July will be slightly larger than in June, as all the Minnesota roads have increased a trifle. The Duluth, Missabe & Northern road expects its July business will be in the neighborhood of 1,800,000 gross tons, which breaks all previous records. The Great Northern is handicapped more than others from insufficient cars, for large orders placed by it last winter have not been filled satisfactorily. The Missabe line was more fortunate than others in this respect. All the roads have been much delayed by delay in timber delivery, and their new ore piers are all behind. That of the Chicago, Milwaukee & St. Paul, at Escanaba, is done, but it was started just about one year ago and was well along when winter came. The Missabe pier, which was to be completed June 1, is not yet ready and has but half its pockets framed and only one spout hung. It cannot be ready before September. This dock is to have spouts 12 ft. wide at the

hinge end similar to the new style adopted at the Northwestern docks at Escanaba, the change from the narrow door leading toward better clearance of ore and greater capacity in pocket and quicker discharge. Old ranges are not holding up in shipments, chiefly on account of the scarcity of men, so that the great bulk of operations must be in mines which can produce the largest tonnage per man—the steam shovel and mill properties of the Mesabi range. Therefore the Mesabi is making up for lessened shipments elsewhere and for the increase of the year.

While the increase in lake shipping, sufficient as it is to add 10,000,000 tons to the annual capacity of the lake fleets, is wheeling into line with speed, there is no sign of any reduction of freights. It looks now as though there might be a runaway lake-freight market this fall in grain, and that the rates on all classes of tonnage would be forced up. The new tonnage coming out along the lakes this summer alone will be able to increase freight handled during this year by about 3,000,000 tons, and this is no small item.

In the undeveloped region around Paint river and north of Iron river the Oliver Iron Mining Company is taking up exploration work and will carry on extensive operations, it is rumored. The company has several thousand acres in that vicinity.

Platteville, Wis. July 28.

A majority of the Wicklow stockholders, under the leadership of A. L. Harris, have raised enough money to pay off all indebtedness, and to continue development work necessary.

In the neighborhood of the Kennedy mine, the Mills Mining and Reduction Company has just completed the largest concentrating plant in the district at a cost of over $40,000. In close proximity are the Little Dad, Northwestern Lead and Zinc, Hoskin, Big Dad, Gray Farm mines.

The Hoskin mine, which recently passed into the hands of Dr. Gill, of Madison, who has succeeded in having the royalty reduced from 20 to 12½ per cent., is making preparations to start up again.

The Beacon Light, near Platteville, is installing one of the largest single-acting lift pumps that has as yet been put in anywhere in the district. It is to be of the improved Cornish type, manufactured by the Galena Iron Works Company, and will be ready for operation early in August.

The owners of the Carlson mine, just south of Platteville camp, have concluded the prospect drilling. Arrangements are being made for the installation of adequate pumping and hoisting machinery. Bids are out for 80-h.p. boiler, engine, pumps, compressor and hoisting equipment.

The power plant at the Hazel Green mine has resumed operation, no work having been done since it was destroyed by fire last spring. The new pumps are of the double-acting crosshead type.

D. C. Keshep, of Knoxville, Tenn., has assumed the superintendency of the Marsden Black Jack. Owing to the impurities in the water it has become necessary to replace the water-tube boilers at the Highland mine with the Standard tubular boilers.

It is reported that oil has been struck at Sand Prairie. Mention was made in the JOURNAL several months ago that a company had been formed to prospect in that vicinity for oil.

Indianapolis. July 30.

There is much rejoicing in western and southwestern Indiana, and especially in the coal industry, in the victory of John R Walsh over his competitors. That he has gained possession of his railroad and secured money to complete the line, means much more for Indiana than the general public realizes. It is conceded that Walsh did much for the prosperity of the country through which his road runs. The Chicago & Eastern Illinois for years had a monopoly of the coal business to Chicago. More coal was offered it than it could haul. Naturally it did not want to see the Walsh road completed. Those who know Walsh best do not believe that he will sell his road at any price. He wishes to complete his project. He has a large investment in Terre Haute, in lands, belt roads and buildings, and has plans drawn for large repair shops.

Scranton. July 30.

President John Mitchell, of the United Mine Workers, arrived in Scranton July 16, and announced that arrangements had been completed to carry out the new method of collecting the dues of the members of the union by stationing a committee of the locals at the pay car each fortnight, to receive the dues from the men when they get their pay. This will be a radical change, and will largely increase the revenue of the union, which suffers from the large number of members who never attend the meetings, and are therefore in arrears with their dues. The new arrangement is rendered possible by the concession of the operators when the new agreement was signed in May last. At that time the mine workers insisted upon recognition of the union, so that the companies would collect the dues by deducting the same from the pay of the men. This was refused, and a compromise was effected by the operators permitting the locals to appoint a committee which would have the right to collect the dues at the pay car. The change is an important one, for the reason that there will be no further excuse for the backsliders who have failed to attend the meetings, mainly because they would be dunned for their dues. Mr. Mitchell's arrival in Scranton was opportune, as, on the same day, District President T. D. Nicholls was nominated by the Democrats for Congress. Mr. Nicholls is in Europe. Mr. Mitchell, however, promised his influence to induce Mr. Nicholls to accept the nomination.

It is announced that the Jermyn Coal Company will endeavor to resume operations at the two Jermyn collieries with non-union labor, and that the aid of the State constabulary will be invoked for the protection of the men. The strike at these collieries has been in progress for six months, the company refusing to accept any terms, except that the men return to work under the old conditions without any written agreement. Last week the men offered to return at the old wages, provided the company would sign an agreement not to discriminate against any of the employees. This was refused.

Elliot, McClure & Co., owners of the Sibley colliery, will sink a new shaft to the Red Ash vein, in connection with the new breaker now being built. The capacity of the colliery will thus be trebled.

Fire was also discovered in the Luzerne slope of the Storrs colliery, of the Delaware, Lackawanna & Western Company in North Scranton. All the miners were rescued without loss of life or injury, and the fire was promptly extinguished.

Fire has for a long time raged in the old mine workings in Carbondale, and the owners have made a contract with C. R. Kinsley, of Scranton, to strip the surface with a view to extinguishing the flames.

After an idleness of several weeks the Boston colliery, of the Delaware & Hudson Company, will resume operations this week. A large steel tower has been built. No. 3 colliery will next be idle, a new steel tower having been ordered for that mine also.

A slush tank has been installed at the Cameron colliery, Hazleton. For many years the slush has been run into the the creek, but it will hereafter be drained into the tank and afterward be dumped on the culm bank.

Leases have been granted in Berwick upon some coal lands with conditions that work be commenced without delay. A diamond drill is to be installed forthwith.

A remarkable suit for damages has been commenced against the People's Coal Company, of Scranton, wherein Frederick E. Carpenter claims $50,000 damages for injuries due to a fall of roof. He claims that previous to his commencing work on the day of the accident, the foreman marked the chamber as safe. He is now paralyzed from the waist down, though his mind is very clear. It is the first suit by a miner for injuries caused by a fall of roof known in the anthracite region.

As a result of a mass meeting held in Centralia, the property owners have organized to appeal to the courts against the action of the Lehigh Valley Coal Company in robbing the pillars under their homes.

The Lehigh Valley Coal Company has given notice to all the families in No. 3,

Hazleton, to vacate, as the houses will be removed to make room for stripping operations.

London. July 21.

Cornwall continues to attract promoters, and this week the prospectus has been issued of the Cornish Tin Properties, Ltd. This company is asking the public for £15,000 to be used in examining properties and floating subsidiary companies. The promoters are not known in City circles, but they apparently mean business. The chief properties they have in view are the Trebell, near Bodmin, and the West Wheal Vor.

A sudden collapse has taken place in the Fresno Copper Company. This company has its headquarters in Glasgow and the properties are 16 miles northeast of Fresno City, California. The company was formed in 1902, and the reports on which the purchase was made were by W. J. Stoneham and others. A few months ago it was deemed advisable to have further independent advice and Frederick J. Siebert was commissioned to make a thorough examination. Mr. Siebert for some reason issued a preliminary report, after looking round, but before making a personal examination of the mine. In this report he said the "Mine will undoubtedly become a very valuable property, etc., if values are as reported." I am afraid a great many people omitted to notice this important qualification. Last week Mr. Siebert issued his final report, written after he had made his own examination. This report unhesitatingly condemns the property and has pricked the bubble effectively. In the interests of the public a full inquiry into this flotation and the methods of concocting monthly reports should be made, but it is probable that the Scotchmen in control will not care to advertise their unusual lack of sagacity. As regards the issue of two reports by Mr. Siebert, the question discussed among mining men here is, why should he issue a report at all until he had made a personal examination.

The report of the Tyee Copper Company, of Mt. Sicker, Vancouver Island, for the year ended April 30 shows that during that time 24,483 tons of ore were taken from the slopes and smelted. The contents averaged 4.9 per cent. of copper, 2.77 oz. silver and 0.149 oz. gold per ton. In addition 4256 tons of custom ore were smelted. The total revenue from matte sold was £102,000, and after deducting the cost of custom ore the net revenue was £91,000. The total costs were £56,000, which leaves a divisible profit of £35,000 for the year, and permits a dividend of 5 per cent. The company now has a reserve fund, invested in securities, amounting to £50 000. During the past year no new orebodies have been discovered, but the directors and managers are still hopeful and have not yet seriously considered the purchase of any other property.

General Mining News.

CALIFORNIA.

AMADOR COUNTY.

Bay State—This company, near Plymouth, has resumed operations under management of the stockholders. Prospecting has been going on in this mine for over 15 years, with short intervals, but those interested have faith in finding something of value in the end.

Bunker Hill—The clean-up at the mill of this mine for last month was not as high as usual, but was satisfactory. There is talk of putting in a larger hoist, which is badly needed. The mine is 1500 ft. deep.

CALAVERAS COUNTY.

Live Oak—At this mine, Railroad Flat, A. F. Merrill superintendent, 10 stamps are turning out money enough to keep up the development work. A tunnel is being run to tap the ledges.

Great Ranch—The Nassau Copper Company has a bond on this mine, and is working it systematically. Some ore is being taken from the 100-ft. level and shipped to the Selby Smelting Company. About 25 men are at work.

Lucous—At this mine on the Mokelumne river, a test run is being made, and if satisfactory, a new hoist will be put in for deeper workings, and the mill will be enlarged.

Easzy Bird—The 10-stamp mill of this company, near Mokelumne hill, is kept busy on satisfactory ore. The new west drift in the lower tunnel is turning out well. The ore carries from 5 to 7 per cent. sulphurets, which are shipped to the Selby smelter.

DEL NORTE COUNTY.

The group of mines in Shelley Creek district, owned by Lauff, Duley and others, are about to be experted with a view to purchase. The property of L. T. Hendricks and others in the Preston Peak country, are also being examined.

GLENN COUNTY.

Charles L. Donohue and B. B. Glascock own a sandstone quarry on the Nye ranch, the product from which is being tested for use in the rebuilding of San Francisco.

HUMBOLDT COUNTY.

Henderson—Frank Liebhart, with a few men, has run a 145-ft. tunnel on this copper property on Horse mountain.

INYO COUNTY.

Black Cañon—This company has a force of men repairing road, building quarters and installing a plant. A dike which crosses the property is to be developed, as well as the quartz vein, and trails have been built up the mountain to facilitate work. Several Tonopah men have become interested in this company, including James L. Butler. The mine is on White mountain, near Bishop.

LOS ANGELES COUNTY.

Good Hope—This mine at Perris, at one time a producer, has been sold to the Shaftrock Mining Company. At one time the mine was sold to Boston men for $350,000, but they defaulted in payments and it came into the hands of Hook Brothers, who have just sold it. A Lane mill is to take the place of the present 20-stamp mill, and a new shaft is to be started.

NEVADA COUNTY.

Woodbury—This mine has been unwatered, and a good ledge has been found in the south 200 drift.

Sultana—Much of the milling machinery of the old Allison Ranch mine has been removed to this mine, and has been put in place.

Fountain Head—This gravel mine consists of 374 acres on the Harmony channel, three miles east of Nevada City, and is about to be sold or bonded.

Gold Flat—Operations have begun in earnest on this mine, of which Joseph Weissbein is president and general manager. San Francisco capital has now been put into the company. As soon as the water is out, the main incline is to be driven 1000 ft. deeper, and a compressor will be installed. There is a good hoisting, pumping and milling plant on the property.

PLUMAS COUNTY.

Indian Valley—At this mine, Greenville, a lower tunnel is to be started to cut the vein at a good depth. Col. E. D. Bannister is in charge.

SAN BERNARDINO COUNTY.

Vontrigger Camp—At this camp, nine miles from Goffs, some new finds have been made recently which have brought it to the front again, after having been partly abandoned.

Wheaton-Morgan—William Wheaton and John Morgan, of this company, who have been prospecting some years in San Antonio cañon, seven miles from Upland, have found high-grade ore on Spring hill. Ore is being packed on burros to the wagon road, and thence hauled by team to the railroad.

SHASTA COUNTY.

Hazel—At the Gladstone mine of this company, at French Gulch, they have a full working force of 100 men.

Rossi—At this mine, recently sold, at French Gulch, a new level is to be driven and a 20-stamp mill will be erected.

Washington—The new management of this company has installed machinery for compressor power, and will soon complete the lower level.

SISKIYOU COUNTY.

Yreka Creek Dredger—This machine has still about six months' work on the Antone Foster garden, and will then be moved down the creek toward Hawkinsville.

TRINITY COUNTY.

Fairview—This mine, of which Charles Doebler is superintendent, has been closed down a couple of months, but has started up again. Work is now being carried on upon No. 4 level.

TULARE COUNTY.

Powell Copper Mine—These properties are being worked and turning out a good grade of ore. It is expected that a sale of the property will soon take place.

TUOLUMNE COUNTY.

Atlas—At this mine, near Tuttletown, the workings are being cleared of water. The mine is under bond.

Bourbon—At this mine, Jupiter district, work is being carried on under supervision of General Manager Adams, and a large vein has been developed.

Consolidated Eureka—This company has sold to C. Y. Delay the old Eureka quartz mine and the Dead Horse Consolidated, both noted producers a few years ago.

COLORADO.

LAKE COUNTY—LEADVILLE.

Big English Gulch—This section is six miles north of Leadville and it heads to Mosquito range. At the beginning of the week an important strike was made in the Eagle group of claims, operated by the J. B. Robinson Mining & Leasing Company, which proves that the gold belt of Breece hill extends into the section. A tunnel was started in the spring at the mouth of the gulch, 400 ft. below the South Park Railroad track, and driven 93 ft. when the ore was caught in the bottom of the tunnel, and is rising to the roof as work proceeds. The character of the ore is quartz stained with copper, with a brown muddy stuff mixed through it. The vein is perfectly flat, and when caught was seemingly the outside of the ore channel; it is in the porphyry, with shales on top.

Fitzhugh—Toward the head of Fryer hill, north, and on the Big Evans gulch side, oxidized ore, running high in value, is being taken out of the old workings. Drifting is going on north through the fault. The property is being worked under lease by Timothy Kyle and associates.

Winnie—A cross-cut has been driven through the porphyry dike and a body of ore 4 ft. wide opened that runs well in gold per ton. The rich streak of ore found in one of the stopes recently still holds out and it has been opened at a point 150 ft. from where it was first encountered. The property belongs to the New Monarch Mining Company.

Little Jonny—This still continues to be the busiest property on Breece hill and is shipping daily 250 tons, including sulphides, silicious and zinc ores. There is a congestion of cars, which keeps the mine from shipping more than the above tonnage, but it is expected that this will be corrected this week. A number of lessees still continue taking out some rich ore.

Breece Hill—In addition to the ore shipped from the Ibex, the Big Four, Big Six, St. Louis tunnel, Fanny Rawlins, Vinnie, etc., are shipping steadily an excellent tonnage of sulphide and silicious ores. The Silver Nugget shaft is still bailing water, but expects to reach the bottom this week. The Enterprise is sinking and is down about 400 ft. in all.

Nil Desperandum—This mine, on Rock hill, has abandoned the southern workings after prospecting them for a number of months, failing to locate the ore channel. The ground is heavily mineralized and some pockets of ore were encountered, but the orebody was never caught. Work is now being carried on to the north and a drift from the bottom of the shaft is in 50 ft., with a small streak of ore at the breast.

Silent Friend—This property, South Evans gulch, has opened a body of ore 4 ft. wide in a drift run from the bottom of the shaft. The ore is silicious in character and carries gold.

Morocco Shaft—This mine, at the foot of Harrison avenue, Leadville, is drifting at the 515-ft. level, has passed through the quartzite and is now in the blue lime, where it is expected the body of ore will be caught. At the 400-ft. level manganese ore is being taken out and shipped to the Steel works at Pueblo.

Murphy Shaft—At this shaft, on Rock hill, the body of ore in the lower levels has widened out considerably and the mine is now shipping 400 tons daily of a good grade of hard carbonates.

Mike Shaft—This shaft, on lower Rock hill, is down 700 ft. and still in the wash. Sinking will be continued until the solid formation is reached, when the diamond drill will be used to prospect the lower zone.

TELLER COUNTY—CRIPPLE CREEK.

The shipments of ore are at present very heavy from the district. Considerable interest is being taken at the present time in the cyaniding of low-grade ores. This more especially refers to the low grade oxidized ores. Some inconvenience has been caused recently to some of the mines by the large amount of rain. A number of new strikes have recently been made in the district, and on the whole the general tone of the district is very healthy.

Portland—This company has recently filed nine different suits in the United States district court in Denver against Stratton's Independence Ltd., and its lessees, for ore alleged to have been extracted from the property of the Portland company. The amounts aggregate about $380,000. A number of the best known leasers in the district are involved in the suits.

Isabella—This company has commenced the erection of a cyanide mill on its property for the purpose of treating the low-grade ores of the mine, of which there is an abundant supply in sight. The erection of this mill has been in contemplation for some time but now the work has actually commenced. The property is situated on Bull hill and at one time shipped a large amount of ore. At present it is being worked by lessees and the company.

Jennie Sample—On account of the suit recently filed by this company against the owners of the Ophir claim, adjoining the property of the company, it has been decided to make a joint survey of all the workings of the two properties. In the suit it was claimed that a large amount of ore had been extracted by the Ophir from a vein that has its apex on the property of the former Jennie Sample.

Acacia—The strike of good ore recently discovered on the South Burns shaft of this company is still holding out well. The ore was found at the bottom of the 800-ft. shaft recently sunk to catch the extension of the ore-shoot found on the Shurtleff property. The ore is being taken out by the Standard Mining and Developing Company of which the principal people reside in Denver. Charles Crowder, of Cripple Creek, is in charge of the work.

Copper Mountain Mill—This mill has been purchased by the Rhyolite-Beacon Gold Mines Company from the creditors of the former owners of the mill. The deal has been pending for some time, but the property was turned over this week. The company has a lease on the Fluorine property on Copper mountain which has in the past taken out a considerable amount of ore. A number of other claims are also under lease. The mill will be overhauled and the low-grade ore of these properties treated.

SAN MIGUEL COUNTY.

Japan-Flora Mines & Tunnel Company—This company, which owns the Japan, Flora, Mikado, Ajax and Valley View groups of mines at Smuggler, resumed work last month under F. C. Bowman, superintendent in charge. Mr. Bowman is at present repairing the old Japan concentrating mill located at the upper workings of the property, with a view to milling about 25,000 tons of blocked ore that is situated above the mill. The development of the lower workings of the Japan and Flora veins will be continued through the new 2700-ft. crosscut tunnel, and the development of the Ajax group, which is the south-east extension of the Smuggler-Union vein will also be prosecuted vigorously, Temple-Ingersoll electric air drills having been installed for that purpose. The company has purchased a five-acre mill-site on the railroad track at Pandora, adjoining the Smuggler-Union mill, and will eventually erect a large concentrating plant at that point, but not until the ore bodies in the various groups are sufficiently

developed to warrant such equipment. At the present time the property shows blocked ore slightly in excess of 100,000 tons. This property recently changed hands. It was formerly controlled by T. Walter Beam, A. J. Clark and David Swickhimer, of Denver, who sold their holdings on a valuation of $600,000 for the entire property. The present directors of the property are: J. J. Fisher, Pittsburg, Pa., president; A. G. Brownlee, Idaho Springs, Colo., vice-president and manager; J. P. H. Cunningham, New Castle, Pa., treasurer; Chas. H. Johnson, New Castle, Pa., and Wm. H. Shinn, Carnegie, Pa. Wm. E. Humphreys, of Denver, is secretary. The main office is at Smuggler.

ILLINOIS.

The Supreme Court has handed down a decision declaring unconstitutional the law which requires that "Every owner or operator of a coal mine in this State shall provide and maintain a washroom at a convenient place at the top of each mine for the use of the miners, and other employees of such mine; and such washroom shall be so arranged that such miners and other employees may hang therein their clothes for the purpose of drying the same."

The court does not question the police power of the State, but holds that the law discriminates between classes of citizens. The decision says, at the close: "The fact that the law proposes to benefit workmen employed in coal mining does not make it valid, in view of the fact that laborers in other employment are surrounded by like conditions and are equally in need of the benefit of this statute.

"It is manifest that for the purposes of this statute no such distinction exists between coal miners and workmen in many other occupations in this State. The evil at which this statute is aimed is one that is not visited alone upon persons employed in coal mines. The legislature cannot ameliorate the coal miners' condition under the guise of an exercise of the police power and leave others unaided who suffer from like causes."

INDIAN TERRITORY.

CHOCTAW NATION.

William Busby, of McAlester, president of the Osage Coal and Mining Company, and the Great Western Coal and Coke Company, is considering the purchase of the mining properties of the Rock Island Coal Company in the Indian Territory. With this end in view, his general superintendent, John C. Reid, and chief engineer, W. S. Newcomb, are examining these properties which consist of three mines in the McAlester vein, No. 5 at Alderson, No. 6 at Bache and No. 38 between them; and three mines in the Hartshorne vein, No. 3 at Gowen, No. 8 at Hartshorne, and No. 7 between them. These mines are all shaft mines except No. 38, which is a slope opened on the outcrop. The depths of the shafts vary from 250 to 544 ft. The total output of the six mines is 2500 tons per day.

INDIANA.

GIBSON COUNTY.

While drilling a test oil-well near Fort Branch the drill pierced three veins of coal, one 12 ft. thick at a depth of 590 ft., one 8 ft. thick at 360 ft., and another 5 ft. thick at a lesser depth. The coal is of excellent quality and the veins will be developed.

VIGO COUNTY.

Vandalia Coal Mining Company—The main offices have been removed from Linton to Terre Haute. John Hewitt, general manager, will have charge of the offices. A branch office will be maintained at Linton.

IOWA.

POLK COUNTY.

Carlson—This is a new coal mine, which is being opened near Berwick on the Great Western road. A. W. Carlson, the owner, has let the contract for the hoisting engine and other machinery to the Eagle Iron Works of Des Moines.

KENTUCKY.

HOPKINS COUNTY.

Brasher—This coal property, at Oak hill, has been sold to Pennsylvania parties, who have organized the Chesley Coal Company to develop and operate it.

Kentucky Coal Mining Company—This company has bought a tract of coal land near Waverly, and will begin work upon it at once.

Nebo Coal Company—This company has leased the coal rights on a large tract at Nebo, near Madisonville. Preliminary work has been begun, and several diamond drills are at work.

LOUISIANA.

Oil pipe lines were declared common carriers by a recent act of the legislature, and the State Railroad Commission is now sending out notices to all the companies to file copies of their charters, rates, tariffs, etc., with the commission. This is preliminary to the commission's taking steps to equalize the rates. The commission is serving notice on all pipe lines that they will be regulated according to law in future.

MICHIGAN.

IRON—MARQUETTE RANGE.

Oliver Iron Mining Company—This company's Champion mine, Marquette range, has begun shipments and about 300 men will be employed underground as soon as a force can be collected. This is something of a task, for the town has been idle for some time and most of the miners there have drifted to other centers.

IRON—MENOMINEE RANGE.

Athens Mining Company—Pickands, Mather & Co., have organized this company, capital $1,000,000, to handle their operations in the Menominee district. This concern has been developing very fast in that part of the Lake for the past year or more, and is now second of all independent operators, its mines including the Hemlock, Baltic, Caspian, and a number of newer properties and explorations, notably the Fogerty and tracts at Stambaugh. Work on the Caspian is proving it to be one of the large mines of the Menominee region, while the Baltic is a good property. Much exploration is now under way at Stambaugh and the indications are said to be excellent. Pickands, Mather & Co. have an added incentive for ore discovery, from the fact of their close affiliation in ore with the Lackawanna Steel Company, for which they are ore agents.

MINNESOTA.

IRON—MESABI RANGE.

Oliver Iron Mining Company—This company's Prince of Wales mine is sinking its new shaft rapidly. The mine's old shaft is 450 ft. deep, and to that depth the new one will be an enlargement of the old, but the larger hole will be driven on down to a depth of 650 feet. The work began in May, and is going on at the rate of about 100 feet per month, including timbering and reconstruction. It is 8x 18 ft. in size and will have three compartments. When finished it will be a main avenue for that part of the Regent mines of the Oliver Company.

Buffalo & Susquehanna—A sale of Mesabi lands is now being closed to the Buffalo & Susquehanna interests that shows how anxious consumers are for iron. It is of a tract just north of the old Mesabi Chief mine, and partakes of the lean and mixed character of that well known deposit. It contains, so far as now explored, about 2,500,000 tons, mostly of an ore that must be washed to become merchantable and carries on an average a good deal too much phosphorus to permit its use in the bessemer process. It is a State lease and in addition to the State 25c. royalty there is a second 25c. a ton, with a minimum of 100,000 tons and a cash bonus of $70,000 for the lease. This bonus is equal to about 3c. per ton cash on all ore so far discovered, including ore that runs far too low to be available in its present state.

MONTANA.

SILVERBOW COUNTY.

Boston & Montana—C. W. Goodale, manager of all mines and smelter, has announced that the work of retimbering the shaft of the Mountain View mine to the 900-ft. station would be finished by Aug. 15, two weeks sooner than expected. The daily output of Mountain View has been 900 tons, but when the shaft is again

in use skips will take the place of cars and cages and the production will be greater. Ore is now coming through an air-shaft that connects with the 1000-ft. level and aggregates 700 tons a day.

Minnie Healey—A 30-ft. vein of commercial copper ore has been opened in the east end of the 1100-ft. workings of this mine by Red Metal (Coalition). The presence of the vein was known, it having been previously explored by diamond drill.

Red Metal—This company is mining a vein of ore on the 1500-ft. level of the Rarus, the ownership of which was questioned prior to the sale of the United Copper property to Coalition. Vice-president Thornton of Red Metal says the quality is better than it was in the upper levels. Boston & Montana and United Copper claimed the vein, but in the adjustment of rights as to Coalition and Boston & Montana the former was given the vein in exchange for other concessions. The shaft on Rarus is deepening. It will be sunk 600 or 800 ft., 200 ft. each lift, and the vein crosscut at each station. In order to air the lower openings and also those of the Minnie Healey and Tramway, two or three new shafts are sinking at various points on Red Metal ground.

Anaconda—The Belmont mine has been taken over by this company in exchange for other property which Coalition, former owner of Belmont, can work to better advantage. Anaconda will equip the shaft with a large hoisting engine and head frame, sink several hundred ft. deeper, connect the lower workings with the south openings from its other mines on the hill and raise ore from the latter through the shaft, thus saving a long haul to the shaft on the Anaconda. As an ore producer, the Belmont has been a failure. The collar of the shaft is about 750 ft. lower than that of Anaconda. Belmont is 900 ft. deep.

North Butte—This company is gradually increasing its ore production and will reach about 1400 tons a day in August.

Davis-Daly—The crosscut from the 1800-ft. station of the Original mine is in 70 ft., and is going ahead rapidly. It is expected that the first vein in Davis-Daly ground will be intersected by Aug. 15. The company is waiting for machinery for its other purposed points of opening, one of which will be the Silver King and another the Mt. Moria, the former a silver producer and the latter a copper.

NEVADA.

ESMERALDA COUNTY.

Florence-Goldfield—In the JOURNAL for July 21, page 127, it was stated that this property was controlled by A. D. Parker, of Denver, and that T. J. Wallace was local manager. We are informed that this was not correct. The property is controlled by T. G. Lockhart and A. D. Parker, Mr. Lockhart being president and also general manager, while Mr. Parker is vice-president and treasurer. Frank Oliver is superintendent of the mine.

HUMBOLDT COUNTY.

Glasgow & Western Exploration Company—This company, of which Otto Stahlman of Salt Lake is general manager, is preparing to install some new smelting devices at its mines near Golconda. Equipment of Mr. Stahlman's own invention, for which patents are now pending, is to enter into the mechanism of the plant.

LYON COUNTY.

Nevada Consolidated Copper Company—At a recent meeting G. M. Borden, F. W. Hills and J. K. McGowan were chosen directors, in place of Homer Loring, S. D. Loring and C. S. Shepherd, resigned. The new directors represent the Guggenheim Exploration Company.

NYE COUNTY.

Tonopah Shipments—Ore shipments over the Tonopah Railroad for the week ending July 21 were: Tonopah, 1875; Goldfield, 1360; Lone Mountain, 30; miscellaneous, 25; total, 3290 tons. The shipments from Tonopah in detail were: Tonopah Company, 960; Tonopah Extension, 455; Belmont, 252; Midway, 60; Montana-Tonopah, 85; North Star, 62; total, 1875 tons.

Mac Namara—A spur track from the railroad is being built to this mine, and a contract has been let for the construction of ore-bins at the mine.

NEW JERSEY.

MORRIS COUNTY.

Teabo—Iron ore has been found in the new shaft at a depth of 725 ft. It is not known yet whether this is the main orebody, or an offshoot.

NEW MEXICO.

SIERRA COUNTY.

Sierra Consolidated—This company, of Hillsboro, has placed a contract with the Traylor Engineering Company, of New York, for hoisting, pumping and electrical machinery, and the steel and iron work necessary for a complete hoisting and crushing plant. The hoisting outfit is for a three-compartment vertical shaft, and there are to be two electric hoisting engines; one with a single drum to hold 1000 ft. of 5/8-in. wire rope, to lift 2000 lb. at a rate of 300 ft. per minute, and the other with two independent drums, each to hold 1000 ft. of 1-in. rope, and capable of lifting a load of 4000 lb. at a rate of 500 ft. per minute. The hoists will be operated by three-phase, 60-cycle, 220-volt, variable speed external resistance induction motors. A complete electrically operated pumping plant is also included in the contract. This will require 17,000 ft. of transmission wire to connect it with the power-house. The current for operating the machinery will be generated by two 125-kw. revolving-field generators, of the water-wheel type, each one direct connected to a 170-h.p. American Diesel oil engine. The contract includes a cage, skips, grizzly, ore-bin gates, steel linings for the ore-bins, a plunger feeder, a belt conveyor 100 ft. long for taking ore from the crushing plant to the stamp-mill bins, sheave wheels, an amalgam box and two steel tanks, one of about 96,000 gal., and the other of about 16,000 gal. capacity.

OHIO.

BELMONT COUNTY.

O'Neill Coal Company—This property, at Herrick, including 700 acres of coal land has been sold to M. A. Hanna & Co., of Cleveland, O. The capacity of the mine is to be increased from 700 to 1000 tons a day.

Manufacturers' Fuel Company—This company's property, including 5600 acres of coal land and two mines, has been sold to J. C. McKinley, of Wheeling, W. Va., who is said to represent the Fairmont Coal Company.

Lafferty—This mine, owned by Columbus parties, has been sold to the Youghiogheny & Ohio Coal Company.

PENNSYLVANIA.

BITUMINOUS COAL.

Pittsburg Coal Company—This company has issued a statement for the six months ending June 30, the figures including all subsidiary companies, except the Monongahela River Consolidated. The income account is as follows:

	1905.	1906.	Changes.
Earnings.....	$1,475,732	$2,384,422	I. $908,690
Coal land deplet'n	$276,060	$369,844	I. $93,784
Depreciation.....	68,339	868,183	I. 504,844
Int. on bonds.....	609,100	588,058	D. 21,042
Total charges..	$948.499	$1,526,085	I. $577,586
Surplus.....	$527,233	$858,337	I. $331,104

Depletion account represents the amount set aside to represent coal mined from the company's property. Depreciation is that of plant and equipment. The coal mined during the half-year was, in short tons:

	1905.	1906.	Changes.
Pittsburg Dis.....	6,075,946	8,236,390	I. 2,160,444
Hocking Dis.....	556,479	653,137	I. 96,658
Total.....	6,632,425	8,889,527	I. 2,257,102
Coke made	168 236	214,658	I. 46,422

Coke made was all in the Pittsburg district. The total increase in coal was 34.0 per cent.; in coke, 27.6 per cent. This gain was made in spite of the labor troubles.

SOUTH DAKOTA.

CUSTER COUNTY.

Lightning Creek—John Clapham is doing work on his placer ground located on Warren gulch and running down to Lightning creek.

PENNINGTON COUNTY.

Montezuma—A five-stamp mill has been erected upon this property for the purpose of making a thorough test of the ore from the different workings.

Lucky Baldwin—The company has finished hauling in lumber and supplies, and is now engaged in sinking the shaft on the New York lode.

Egyptian-Holy Terror—Fifty tons of ore are being hauled daily from the Egyptian to the old custom mill. The company is working two shifts.

TENNESSEE.

We are indebted to J. W. Allen, statistician, for the following particulars in relation to the coal production of the State in 1905. The total output of the mines was 5,552,576 short tons; an increase of 705,334 tons, or 14.6 per cent., over 1904. The average value of the coal last year was $1.17 per ton at the mines; the total value was $6,496,865. There were 103 mining machines in use in the State; the coal mined by machines was 604,879 tons, or 10.9 per cent. of the total.

The average number of employees reported at the mines was 10,517; the average number of days worked was 217. This shows an average output per employee of 528 tons per year, or 2.39 tons per day. The average wage paid was $1.88 per day. The total amount paid in wages for the year was $4,293,524; an average of $408.25 per employee.

The number of fatal accidents during the year was 29; an average of 2.76 per 1000 employees, or of 0.013 per 1000 days' work.

The production of coke in 1905 was 433,750 short tons; the average value being $2.50 per ton at the ovens.

UTAH.

BEAVER COUNTY.

Lulu—A winze is being sunk below the 500 level of this property at Frisco. At 50 ft. a crosscut will be run to connect with the orebody on the fifth level.

Blue Bird—Development of this property, under bond to J. F. Burns, of Cripple Creek, Colo., is progressing.

JUAB COUNTY.

Lower Mammoth—The directors of this corporation have agreed that to operate the mine economically the main shaft will have to be sunk 500 ft. This work will probably be undertaken as soon as financial matters are arranged. The mine is now about $19,000 in debt.

Tintic Ore Shipments—Shipments last week amounted to 101 carloads of crude ore and 2 cars of concentrate. The shippers and number of carloads were: Ajax, 1; Black Jack, 7; Carisa, 7; Mammoth, 1; Victoria, 6; Grand Central, 3; Uncle Sam, 4; Centennial Eureka, 25; May Day, 2; Eagle & Blue Bell, 8; Beck Tunnel, 4; Sunbeam, 2; Yankee, 4; Scranton, 1; Swansea, 9; Dragon Iron, 8; Gemini, 5; Godiva mill (concentrate), 2 carloads.

SUMMIT COUNTY.

Park City Ore Shipments—These shipments last week aggregated 1,144,000 lb., the shippers and amounts being: Daly West, 1,040,000; Silver King, 1,144,000; Daly Judge, 986,870; Daly Judge (zinc middlings), 481,290; Little Bell, 445,500; Kearns-Keith, 145,100 pounds.

Foreign Mining News.

CANADA.

BRITISH COLUMBIA.

Atlin—The Societe Miniere de la Colombie Britannique, engaged in hydraulic mining on Boulder creek, made its first clean-up this season at the close of June, with a recovery of about $10,000 in gold. During previous seasons the company washed chiefly gravel from the bed of the creek; this season, under the direction of T. Obalski, operations were carried into one of the benches alongside the creek, with satisfactory results.

ONTARIO.

The requests of mining men for improvements in the recording and inspection system have been met by the opening of a branch record office at Cobalt, in charge of T. A. McArthur. Prof. M. B. Baker has been appointed assistant inspector.

Gillies Timber Limit—The exploration party in charge of Prof. W. G. Miller, provincial geologist, who are making a systematic examination of the Gillies timber limit, near Cobalt, preparatory to its being worked by the provincial government, have struck a vein of smaltite 6 in. wide at a depth of 3 or 4 ft. It is regarded as altogether probable that other smaltite veins occur in the same neighborhood. The vein will be stripped, and a thorough examination made.

Coal Trade Review.

NEW YORK, Aug. 1.

In the West the last remains of the coal-strike troubles are gradually passing over and working mines are the rule. In fact, we hear of frequent suspensions, as the result of overstocked markets. The Lake trade is behind, and a rush of coal up the Lakes is expected next month, to make up the supply of the Northwest.

In the East, the anthracite and bituminous trades are both seasonably quiet, and there are no new developments.

COAL TRAFFIC NOTES.

The coal and coke traffic originating on al the lines of the Pennsylvania Railroad east of Pittsburg and Erie for the year to July 21 was as follows, in short tons:

	1905.	1906.	Changes.
Anthracite	2,599,060	2,337,723	D. 261,337
Bituminous	15,575,514	17,145,604	I. 1,570,090
Coke	6,057,446	6 984,699	I. 927,253
Total	24,232,020	26,468,026	I. 2,236,006

Shipments of Broad Top coal over the Huntingdon & Broad Top railroad for the week ending July 28 were 13,534 tons; for the year to July 28 they were 434,971 tons.

Coal shipments originating on the Southern Railway for the five months ending May 31 were in short tons; Tennessee district, 726,350; Alabama district, 798,171; total, 1,524,521 tons.

Shipments of Nova Scotia coal, by companies, for the half-year ending June 30 were as follows:

	1905.	1906.	Changes.
Dominion Coal	1,156,810	1,430,596	I. 273,786
Cumberland	187,679	223,474	I. 35,795
N. S. Steel	187,462	264,913	I. 77,451
Inte colonial	88,089	139,543	I. 51,454
Acadia	115,291	125,320	I. 10,029
Inverness	56,081	72,458	I. 16,377
Total	1,791,412	2,256,304	I 464,892

The total gain was 26 per cent. All the companies report increased shipments this year.

New York. Aug. 1.

The hard-coal market outwardly gives little indication of its real activity. The mines are working full time, and large and regular shipments of coal are being sent forward. The outlet for the greater part of the production is found toward the West, where stocks have to be laid in before the close of lake navigation. Deliveries to the seaboard flow through their regular channels, part of them, no doubt, being put into stock piles for the purpose of saving the final advance in price. The sales of hard coal in July have exceeded all expectations, and not much surprise will be felt if deliveries in August are larger than usual for that month.

The domestic sizes are in strong demand, and deliveries are promptly disposed of upon arrival. The steam sizes, however, are rather dull, as is natural with the present rate of output. Prices on the domestic sizes advance today 10c. per ton, and will remain throughout August at $4.65 for broken and $4.90 for egg, stove and chestnut. Steam sizes remain at their regular prices: $3 for pea, $2.25@2.50 for buckwheat, $1.45@1.50 for rice and $1.30 @1.35 for barley; f.o.b. New York harbor shipping points.

BITUMINOUS.

The Atlantic seaboard soft-coal trade is dull, but there are some signs of a small improvement, which would seem to mean that some stocks have been depleted to a considerable extent. The producers are shutting down their operations in some cases by 40 or 50 per cent., but they are looking for a decided improvement next month. There is a shortage of labor at most mines, and if this is the situation at this dull period, it may become a pressing question when the trade gets more active.

Some of the railroads complain of a shortage of cars on account of the heavy demand for them in the West. The supply of cars for transportation to tidewater is fairly good. The New York Central and the Reading report a shortage; the Baltimore & Ohio has embargoed certain classes of cars to various points, and has thereby embarrassed all shippers, except some favored ones. Transportation to

tidewater is fairly good but it varies considerably in respect to all-rail points.

Trade in the far East is quiet, with here and there an inquiry from sources that have heretofore been using only their surplus. The Sound is taking on a little more coal, though not in important amounts. Not much coal is moving in New York harbor, but, at the same time, none is accumulating. Prices range from $2.60@2.75 for the better grades of steam coal down to $2.40 for poorer grades and gas coal.

Vessels in the coastwise market are in fair supply but rates hold firm. Current quotations from Philadelphia are as follows: to Boston, Salem and Portland, 60@65c.; to Lynn, Newburyport and Bath, 80@85c.; to Portsmouth, 65@70c.; to the Sound, 50@55c.; to Bangor, 75c.; to Saco and Gardiner, 90c. and towages.

Birmingham. July 30.

The coal output is the heaviest for this time of year ever known in this State. The work on new coal washers and crushers for the Tennessee Coal, Iron and Railroad Company is being pushed. The matter of an increased output of coke is an important one.

Announcement is made that the Alabama Fuel & Steel Company, headed by Nashville, Tenn., men, which already has mines in St. Clair county, northeast of Birmingham, has purchased land in the southern part of Jefferson county, and will immediately begin the opening of coal mines.

Chicago. July 30.

The wholesale coal trade continues very dull for both bituminous and anthracite. Except for the threshing trade little life is manifest anywhere.

Consignments of coal from the mines of Illinois and Indiana continue to pour into the local market without restriction. In many cases, the coal brings less than it cost to mine. Eastern coals are in better condition; though the demand is light, the consignments are restricted, so that there is no sacrificing of prices to avoid demurrage charges.

Fine coals continue to be most in demand, to the detriment of the trade that relies on selling larger sizes. Screenings from Illinois and Indiana mines bring $1.25@1.50; run-of-mine $1.30@1.50 and lump—whenever it can be sold—$1.60@2.20. Coal from southern Illinois is relatively lower in price and greater in supply than that from northern Illinois mines.

Eastern coals are so well restricted that they are holding well up to circular prices and in some cases bringing 10@20c. more. Hocking and smokeless are somewhat scarce. Youghiogheny is in very good demand, bringing $3@3.10 per ton.

Cleveland. July 31.

The coal operators and the miners in No. 8 district came to terms during the past week. The mines were opened for business yesterday morning. They will be shipping coal into this territory and to the lakes during the latter part of the week. The Hocking district has not been idle for the past two weeks.

Coal conditions on the lakes vary with the shippers. One concern announces that its movement to date is as heavy as that a year ago. Other shippers, however, have been able to move but a small fraction, and their big movement must come in the fall. These varying conditions make the lake market exceptionally uncertain. During the week some shippers have chartered tonnage for loading during the next two months at 50c. to Lake Michigan, an advance of 10c. Other shippers, to get small boats, which are scarce, are paying premium rates, some paying 80c.

In this territory the market is weak, with mine-run coal at 95c.@$1 and going lower. Slack is selling at 75@80c. Coke is exceptionally strong with buyers eager. The market is hanging about $3 and upward for 72-hour foundry coke and $2.65 at the oven for furnace coke.

Indianapolis. July 30.

The conference between coal miners and operators held in Terre Haute, July 26, over the slate removal dispute resulted in what is thought to be a peaceful solution, which will avert the threatened general suspension of mining in the Linton field. The operators abandoned the demand for the removal of one mine car of slate a day, which the mine bosses had fixed as the amount a miner should remove without pay, and miners will only be required to move the same amount of slate that they did last year. The 1200 miners have returned to work. The new contract provided for the removal of a "reasonable" amount of slate. This proved too indefinite, and nearly brought about another suspension.

Pittsburg. July 31.

Coal—Production continues heavy and there is a good supply of railroad cars. The prices are practically unchanged, quotations this week being on the basis of $1.05@1.15 a ton for mine-run coal at mine. The Pittsburg Coal Company has been making extensive improvements and its output is being increased daily. All the mines along the rivers are in operation and an enormous tonnage has been loaded. The expected rise did not come, and unless the rivers are navigable soon there will be no empty boats or barges, and mines will be forced to suspend operations.

Connellsville Coke—For the first time in several years prices of furnace and foundry coke are about the same. Furnace coke prices have advanced and quotations this week range from $2.60 to $2.75 and foundry coke is quoted at $2.75, but one sale is reported at $2.85 a ton. The *Courier* reports production for the week at 272,393 tons and shipments at 14,190 cars distributed as follows: To Pittsburg and river points, 4778 cars; to points west of Pittsburg, 7756 cars; to points east of Connellsville, 1656 cars. The production in the Lower Connellsville region amounted to 102,668 tons.

Foreign Coal Trade.

Aug. 1.

Sales of coal from Transvaal mines in June were 250,017 tons, made up as follows: Middleburg district, 130,709; Springs-Brakpan, 95,906; other districts, 23,402. The average price realized was $1.38 per ton at the mine.

The United States Government, through Dr. Goding, consul at Newcastle, New South Wales, asks tenders for 35,000 tons of Newcastle coal, to be delivered at Manila, Philippine Islands.

Iron Trade Review.

NEW YORK., Aug. 1.

The general conditions are unchanged, so far as the unwonted rush of midsummer orders is concerned. Everywhere there is a demand for material. Pig iron is scarce for early delivery, especially in the foundry grades, and an advance in prices is the rule for any deliveries this year. Steel billets and sheet-bars are also scarce, and some mills are embarrassed by inability to get such material. A strong demand has developed for plates, and structural steel also continues to be called for. This is an unprecedented situation for August and assures heavy business for the balance of the year.

United States Steel Corporation—The statement of earnings, given out today is as follows for the half-year ending June 30:

	1905.	1906.
First quarter	$23 025,896	$36,634,490
Second quarter	30,305,116	40,125,033
Half-year	$53,331,012	$76,759,523

The total increase this year was $23,428,511, or 43.9 per cent. The income account for the June quarter is as follows:

Net earnings	$40,125,033
Subsidiary Co. sinking fund	$547,756
Depreciation and reserve	5,604,289
Interest and sinking fund	6,936,963
Special improvement fund	2,500,000
Additions to property	13,000,000
Total deductions	$28,589,008
Balance, surplus	$11,536,025
Dividend on preferred stock	6,304,919
Net surplus	$5,231,106

The surplus remaining from the March quarter was $5,567,000, making a total of $10,798,106. From this the directors declared a dividend of 1 per cent. on the common stock, which will require $5,083,025; leaving a surplus of $5,715,081 carried forward.

The unfilled orders on the books June 30 amounted to 6,809,589 tons, which is 209,123 tons less than on March 31, but 1,979,934 tons more than on June 30 of last year.

Birmingham. July 30.

Pig-iron quotations in Alabama have sought a level right now at $13.50 per ton for No. 2 foundry. The effort to advance prices was not successful. Some healthy sales were made during the past week between $13.25 and $13.50 per ton, No. 2 foundry, while the firm quotation is now at the last mentioned price. The sales made recently will require a goodly portion of the probable make for the next three months. The smaller manufacturers in this State are not in a position to sell much iron.

There is no change in conditions at the steel plants. The plants at Gadsden and Ensley are in full operation. In foundries and machine shops, all plants are doing well and have business in hand. The plant of the Payne & Joubert Company at East Birmingham begins operations this week.

BY TELEGRRAPH.

BIRMINGHAM, ALA., Aug. 1.—The furnace companies now demand $14, Birmingham, for No. 2 foundry, and do not care to take business under that price.

Cleveland. July 31.

Iron Ore—All other shippers on the lakes are bidding strongly for lake tonnage for fall use and the ore shippers will have to bid in competition or lose the boats in the wild trade. The movement for July will exceed 5,700,000 tons, according to present estimates. The bidding for high-grade ore continues and premiums are being paid. The movement of low-grade ore is sufficient.

Pig Iron—Buying of foundry pig iron has taken a spurt. Spot material is out of the market, except such supplies as come from the East, southern Ohio, the Birmingham district and one furnace interest in this territory. All prices have been marked up. Southern Ohio No. 2 sold here at $18.15 delivered and is now $18.45. The Birmingham district is selling at $14 Birmingham for No. 2. Northern iron is strong, at $17, which is paid for both spot and for delivery as far ahead as through the first quarter of next year.

Finished Material—Billets are still scarce and strong, with the forging quality selling at $34@35 delivered in Cleveland; bessemers are $29@30 Cleveland. One more ship order has been placed calling for 4000 tons of steel. This market is taken care of since the Pittsburg mills, which get the business, set aside a portion of their output for this trade. Bar iron is stronger.

Chicago. July 30.

Firmness, marked by increasing sales both in the aggregate and the size of individual orders, characterizes the local iron market. Prices have strengthened noticeably. There is a demand for iron for quick deliveries, that is causing premiums of 25@50c. to be demanded and paid. General sales are running well into the first quarter of 1907. Northern iron has become more in demand than Southern, relatively, and is quoted at $18.75@19.25. Southern brings $13.50, Birmingham ($17.40 Chicago) minimum, with a tendency to advance.

General business in iron and steel products is somewhat quiet, but remarkably good for the middle of summer. Coke is active, following the increased demand for pig iron, with 72-hour Connellsville selling readily at $5.65 per ton.

New York. August 1.

Pig Iron—Business is better, and there has been quite a strong demand for foundry iron. Some Northern furnaces have put up prices for fourth-quarter iron, but no sales at the higher figures are reported. Southern is now firm at $13.50, Birmingham for No. 2 foundry. No concessions are in order and $14 will be asked.

Current quotations for pig iron are, for New York or parallel delivery:

Northern:	
No. 1 X foundry	$18.50@$19
No. 2 X foundry	18@18.50
No. 2 plain	17.25@17.75
Forge pig	16@16.50
Southern:	
No. 1 foundry	18@18.50
No. 2 foundry	17.25@17.75
No. 3 foundry	16.50@16.75
No. 4 foundry	15.50@16
No. 1 soft	18@18.50
No. 2 soft	17.25@17.50
Gray forge	15@15.50
Basic pig:	
Northern	17.50@17.75
Virginia	17.60
Alabama	17.75@18.25

City or local deliveries are not included in prices, which are for large lots, on dock or cars.

Bars—Bar iron is in fair demand and prices are 1.645c., tidewater. Steel bars are quoted 1.645c. Store trade is fair, at 1.75c. delivered. There are some reports of cutting on common iron.

Plates—Tank plates are quoted at 1.745 @1.825c., tidewater, according to width. Flange and boiler are 1.845, and fire-box 2.045c. Jobbers ask higher prices for small lots. Local trade is improving.

Structural Material—Prices are nominally unchanged. Beams under 15 in. are 1.845c. for large lots; over 15 in., 1.895c.; angle and channels, 1.845c., tidewater delivery. A large lot of the business here is done by jobbers, who are asking 2.50c. for beams and channels out of stock. Negotiations for some large local contracts are pending.

Old Material—The scrap market is a little more active, and dealers are hopeful. Heavy steel melting scrap is $15@15.50; No. 1 railroad wrought, $17@17.50. Steel scrap is in demand.

Philadelphia. Aug. 1.

Pig Iron—Orders have been booked for some 7000 tons of basic, with inquiries for additional quantities. Prices of nearly all kinds of pig iron have advanced 50c. a ton for future delivery, although not all of the business done within a few days has been at this advance. Round lots of foundry have been taken for 60 days' delivery in this and in New England territory. Consumers of pig iron are betraying a good deal of anxiety to place orders for autumn requirements. No. 1 X foundry is $19.25; No. 2 X foundry $18.75; No. 2 plain $18; standard gray forge $16.50; basic $18; low phosphorus $25; bessemer nominally $20.

Steel Billets—A good week's business has been done. The figure given is $29. Forging billets have been selling here in a small way at $33.

Bars—Common iron has been selling more freely than any other kind, due to the activity of car builders as well as smaller consumers. Refined bar iron is quoted at 1.68½; an upward tendency is apparent for small lots for early delivery.

Sheets—All of our sheet mills in this territory are running full time. Quotations 2.40@2.80c.

Plates—A large amount of business is being done among the smaller buyers.

Merchant Steel—Merchant steel has shown a midsummer activity that is unusual.

Structural Material—A great deal of business is now being done with contractors and builders who are hurrying up their work and want fall delivery. Quotations range from 1.83½ to 2 cents.

Scrap—The scrap market has developed unexpected strength. No. 1 steel scrap is scarce at $16.50; railroad No. 1 wrought brings $19; machinery scrap $16, and low phosphorus scrap is wanted at $20.50 per ton.

Pittsburg. July 31.

The scarcity of bessemer and open-hearth billets and sheet-bars continues, deliveries on old contracts being very unsatisfactory, and it seems impossible to place any new orders in this market. It is reported that a Pittsburg consumer bought 5000 tons of open-hearth billets in the eastern market. The Republic Iron and Steel Company, which entered the market as a seller about a month ago, has not been able to supply the unusual demand. It is reported to have sold 5000 tons of sheet-bars to the new company which bought the six-mill tin-plate plant at Atlanta, Ind., and converted it into a sheet plant. The new bessemer steel works of the Youngstown Sheet and Tube Company are expected to be in operation about the middle of August, producing at the rate of 2000 tons of ingots a day. Sales of steel rails during the week have been light, and the contract from the Southern Railway for 30,000 tons has been cut down to 15,000 tons. The Carnegie Steel Company is the only rail-making interest that is in position to take on new business for this year's delivery. Contracts have been placed for plates for 11 new lake freighters recently placed

with different ship builders. The bulk of the business has been awarded to the Carnegie Company, which may transfer some of the tonnage to the Illinois Steel Company, as it has practically all it can do for the rest of the year, and some of the boats may be built nearer to Chicago than Pittsburg. Some of the plate tonnage has been placed with the Lackawanna Steel Company. Orders for structural material continue to be placed, but none for large tonnages. The most important was for 1300 tons for the new Willock warehouse on the Monongahela river front. Sheet and tin-plate buying continues, but mills are unable to make deliveries, and are all falling farther behind every week.

Pig Iron—The minimum of bessemer pig iron is $18, Valley furnaces, and 3000 tons were sold at that figure yesterday, one lot of 1500 tons and the rest in lots of 200 to 500 tons, all for delivery in August and September. It is believed the price will not fall any lower this year, or for the first quarter of 1907. Foundry iron is scarce, and no sales are reported for this quarter, one furnace interest declaring that none is available. For the last quarter and first quarter of next year $17@17.25 is quoted, and a number of inquiries have been received for late deliveries. The Westinghouse Machine Company is in the market for 5000 tons of foundry iron for delivery in the last half. Furnaces outside of the Pittsburg and Valley districts have advanced the price of foundry iron and $16.50 at Virginia furnaces is quoted for No. 2, the freight to Pittsburg being $2.55. Southern No. 2 is quoted at $14, Birmingham, and the freight rate is $4.60 a ton. Gray forge has become firmer, and is quoted at $16.60, Pittsburg, and the minimum price of basic iron for any delivery is $17.50, Valley furnaces. W. P. Snyder & Co. seem to be the only interest that is able to take on any new business in bessemer and basic iron for delivery in the third quarter.

Steel—There is but little change in the billet market. Both bessemer and open-hearth billets are hard to get, and prices remain nominally at $27.50 for bessemer, and $28@29 for open-hearth. Sheet-bars are still quoted at $29. There is no change in plates, and 1.60c. is quoted, steel bars continuing at 1.50c.

Sheets—Mills are unable to catch up on orders, and most of them are from three to four months behind in deliveries. Black sheets are strong at 2.50c., and galvanized at 3.55c. for No. 28 gage.

Ferro-Manganese—The market is quiet and some dealers are not making any quotations. No sales of any consequence are recorded, and it is believed that $90 could be done for prompt shipment, and $85 for delivery later in the quarter.

Cartagena, Spain. July 14.

Iron and Manganiferous Ores—Messrs. Barrington & Holt report that shipments for the week were one cargo, 650 tons manganiferous ore, and one cargo, 1607 tons dry ore, to Great Britain; three cargoes, 13,800 tons dry ore, to Rotterdam; one cargo, 5900 tons dry ore, to Sydney, Cape Breton. New business is quiet, although there are already inquiries for next year.

Quotations are: Ordinary 50 per cent. ore 8s. 9d.@9s.; special low phosphorus, 9s. 3d.@9s. 6d.; specular ore, 58 per cent., 12s. 1d.; S. P. Campanil, 10s. 6d. per ton. Manganiferous ores range from 12s. for 35 per cent. iron and 12 manganese, up to 18s. 3d. for 20 per cent. iron and 20 manganese. All prices are f.o.b. shipping port.

Pyrites—Iron pyrites, 40 per cent. iron and 43 sulphur, are quoted at 10s 8d. per ton, f.o.b. shipping port.

Dusseldorf, Germany. July 18.

Exports of iron and steel of all kinds from Germany for the five months ending May 31 were, in metric tons:

	1905.	1906.	Changes.
Iron and steel	1,249,464	1,490,970	I. 241 506
Machinery	116,225	110,665	D. 5,560
Total	1,365,689	1,601,635	I. 235,946

The total increase was 17.3 per cent. Owing to a change in the form of the returns, ore exports can only be given for the three months, March to May inclusive; for that period in 1906 they were 906,961 tons. These exports were chiefly minette ores from Luxemburg, to France and Belgium.

Imports of iron and steel into Germany for the five months ended May 31 were, in metric tons:

	1905.	1906.	Changes.
Iron and steel	121,902	175,009	I. 53,107
Machinery	32,072	34,882	I. 2,810
Total	153,974	209,891	I. 55,917

Imports of iron ore for the three months March to May, 1906, were 1,944,502 tons. These imports were chiefly from Spain and Sweden. Imports of manganese ore for the three months were 91,345 tons.

Brussels, Belgium. July 20.

The output of pig iron in Belgium for the half-year ended June 30 was, in metric tons:

	1905.	1906.	Changes.
Bessemer and basic	503,195	528,760	I. 25,565
Forge	104,890	118,440	I. 13,550
Foundry	50,785	50,865	I. 80
Total	658,870	698,065	I. 49,195

On June 30 there were 42 blast furnaces in Belgium, of which 36 were in blast and 6 idle.

Chemicals.

NEW YORK, Aug. 1.

Copper Sulphate—The market continues strong, and deliveries somewhat slow, two or three weeks being required to fill orders. Quotations are $6.12½ per 100 lb. for carload lots, and $6.25 for smaller quantities.

Nitrate of Soda—The market is strong and prices continue upward. The demand is exceedingly good, but the supply is limited. Labor is scarce in the nitrate fields, and conditions among the operatives are unsettled. An increase rather than a drop in prices is looked for, owing to the present state of the market. We quote prices as follows: For 96 per cent., 1906 delivery, $2.50@2.55 per 100 lb.; 1907 delivery, $2.40 for 95 per cent. and $2.47½ for 96 per cent. Dealers do not care to quote very closely for 1908 delivery but $2.30 for 95 per cent. and $2.37½ for 96 per cent. may be taken as a fair figure.

Jackson Brothers report from Valparaiso, Chile, under date of June 23, that activity has suddenly developed, and prices are higher, 8s. 1d. being paid for spot and 8s. 5d. for forward 1906 deliveries. The production for the five months ending May 31 was 14,915,432 quintals, a decrease of 306,404 quintals from 1904; exports, 13,257,009 quintals, an increase of 455,694 quintals over last year.

Metal Market.

New York, Aug. 1.

Gold and Silver Exports and Imports.

At all United States Ports in June and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
June 1906..	$3,256,392	$2,374,261	Exp. $882,331
" 1905 .	4,030,882	2,149,051	" 1,881,831
Year 1906..	31,610,714	52,542,959	Imp. 20,932,245
" 1905..	39,831,590	16,609,453	Exp. 23,222,137
Silver:			
June 1906..	4,518,386	3,740,285	" 778,101
" 1905 ..	4,744,625	2,356,078	" 2,388,547
Year 1906 ..	33,437,227	23,657,101	" 9,780,126
" 1905 ..	25,091,266	15,173,423	" 9,897,843

These statements cover the total movement of gold and silver to and from the United States. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York.

For week ending July 28 and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$ 2,030	$ 933,182	$ 907,904	$ 18,423
1906	5,903,003	46,042,245	35,850,548	1,240,894
1905	37,919,943	845,445	18,480,684	2,273,513
1904	63,730,202	3 622,821	23,583,394	565,488

Exports of gold for the week were to Mexico; of silver, nearly all to London. Imports of gold for the week were principally from Germany; of silver, from the West Indies and Panama.

The statement of the New York banks—including all the banks represented in the Clearing House—for the week ending July 28 gives the following totals, comparisons being made with the corresponding week of 1905:

	1905.	1906.
Loans and discounts	$1,144,847,400	$1,058,415,100
Deposits	1,199,744,900	1,060,116,900
Circulation	48,804,600	47,044,300
Specie	224,830,700	194,450,900
Legal tenders	90,411,500	89,470,800
Total reserve	$315,242,200	$283,921,700
Legal requirements	299,936,225	265,029,225
Surplus reserve	$15,305,975	$18,892,475

Changes for the week this year were increases of $12,746,400 in loans, $1,384,600 in specie, $1,961,300 in legal tenders and $15,377,700 in deposits; decreases of $859,100 in circulation and $498,525 in surplus reserve.

The following table shows the specie holdings of the leading banks of the world:

	Gold.	Silver.	Total.
New York.....	.....	.....	$194,450,900
England.... ...	$185,948,620	.....	185,948,620
France.....	584,617,435	$212,469,365	797,086,800
Germany	179,635,000	59,880,000	239,515,000
Spain..	75,895,000	123,575,000	199,470,000
Netherlands...	27,606,500	28,946,500	56,553,000
Belgium.....	16,120,000	8,060,000	24,180,000
Italy.....	148,315,000	19,644,000	167,959,000
Russia..... .	546,335,000	30,030,000	576,365,000
Austria.	235,100,000	62,795,000	297,895,000
Sweden....	19,375,000	.....	19,375,000

The returns of the associated banks of New York are of date July 28, and the others July 27. The foreign bank statements are from the *Commercial and Financial Chronicle*, of New York. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows for the year to July 19:

	1905.	1906.	Changes.
India....	£ 3,878,141	£ 9,886,963	I. £ 6,008,822
China....	687,770	116,600	D. 571,170
Straits..	2,800	1,750	D. 1,050
Total.....	£ 4,568,711	£ 10,005,313	I. £ 5,436,602

Receipts for the week were £14,000 from the West Indies and £433,500 from New York; a total of £447,500. Exports were £1,500 to Egypt and £134,500 to India; £136,000 in all.

Indian Exchange continues firm, all the Council bills offered in London being taken at 16d. per rupee. The demand for silver for India continues large.

Prices of Foreign Coins.

	Bid.	Asked.
Mexican dollars.....	$0.50½	$0.53
Peruvian soles and Chilean.....	0.46¾	0.49¼
Victoria sovereigns.....	4.85⅛	4.87⅛
Twenty francs.	3.86	3.89
Spanish 25 pesetas...	4.78	4 80

SILVER AND STERLING EXCHANGE.

July.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	July-Aug.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
26	4.84¾	65	30 1/16	30	4.84¾	64⅞	30
27	4.85	65	30 1/16	31	4.85	65	30 1/16
28	4.84¾	65⅛	30⅛	1	4.85	65	30 1/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals.

Daily Prices of Metals in New York.

July-Aug.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
26	18⅛ @18⅛	18 1/16 @18⅛	83	37	5.75	6.02½	5.87½
27	18⅛ @18⅛	18¼ @18⅜	82¾	37⅛	5.75	6.02½	5.87½
28	18⅛ @18⅛	18¼ @18⅜	. . .	37⅛	5.75	6.02½	5.87½
30	18⅛ @18¾	18¼ @18⅜	83¼	37⅛	5.75	6.02½	5 87½
31	18⅛ @18¾	18¼ @18⅜	82⅝	37⅛	5.75	6.02½	5.87½
1	18⅛ @18¾	18¼ @18⅜	81⅞	37⅛	5.75	6.02½	5.87½

London quotations are per long ton (2,240 lb(standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars. The price of cathodes is usually 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting & Refining Co. for near-by shipments of desilverized lead in 50-ton lots, or larger orders. The quotations in spelter are for ordinary western brands; special brands command a premium.

The silver market has ruled very steady the past week, with small fluctuations. At present the Indian mint is not buying, but its resumption of purchases is expected shortly.

Copper—An active business was done during the latter part of last week, consumers both in the country and Europe placing liberal orders for prompt and future shipment. The advance in prices has made further progress, and at the close lake copper is quoted 18⅝@18¾; electrolytic 18¼@18⅜; casting copper, ordinary brands, 18@18⅛.

The standard market in London has become a rather dull and indifferent affair, and prices have fluctuated within narrow limits. The close is easy at £81 17s. 6d. for spot and £81 7s. 6d. for three months.

Refined and manufactured sorts are quoted: English tough, £85@£85 10s.; best selected, £87; strong sheets, £93.

Statistics for the second half of July show an increase in the visible supplies of 400 tons.

Exports in July so far have shown an increase over previous months of this year. Owing to the unusually late appearance of the report of the Bureau of Statistics the full statement cannot be given till next week.

Exports of copper from New York for the week were 1325 long tons. Our special correspondent reports the exports from Baltimore for the week at 3791 long tons of fine copper. In addition, there were exports from Baltimore of 43,595 lb. copper sulphate.

Tin—There appears to be a deadlock between the forces working in London on opposite sides of the market, but, taking everything into consideration, the bull contingent has slightly the better of it. The market in London closes firm at £171 2s. 6d. for spot and £171 7s. 6d. for three months, while business here is being done at 37¼@37½c.

Statistics for the month of July have increased 1600 tons.

Lead—Brands controlled outside of the biggest interest can be had somewhat below the official quotations, which continue at 5.75c. New York, but on the whole, the market remains unchanged. In London a slight easing off is noticeable and quotations at the close are £16 12s. 6d. for Spanish and £16 13s. 9d. for English lead.

St. Louis Lead Market—The John Wahl Commission Company telegraphs us on Aug. 1 as follows: Lead is quiet and steady; latest sales are on a basis of 5.65c., East St. Louis, for Missouri brands.

Spanish Lead Market—Messrs. Barrington & Holt report, under date of July 14, that silver has been 13.25 reales per ounce; exchange is 28.04 pesetas to £1. Lead has been 77 reales per quintal, equal, on current exchange, to £15 7s. 7d. per long ton, f.o.b. Cartagena. Shipments were 360 tons desilverized to Manchester; 100 tons desilverized and 279 tons argentiferous lead to Marseilles.

Spelter—A fair amount of business is being done from day to day, but the demand is readily satisfied at unchanged prices. These are 6.02½c., New York, and 5.87½c. St. Louis. Reports from London indicate an easy condition and the close is lower at £26 10s. for good ordinaries and £26 15s. for specials.

St. Louis Spelter Market—The John Wahl Commission Company telegraphs us on Aug. 1 as follows: Spelter is firm, with a reasonably good demand, at 5.92½c. Latest sales are on that basis.

Spanish Zinc Ore Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of July 14, that the local market is quiet. Shipments for the week were 150 tons blende to Stettin; 3160 tons blende to Antwerp.

Antimony—The market is without feature. Quotations are nominal and unchanged, at 22½@23c., for ordinary grades, and 24@25c. for specials.

Nickel—Quotations for large lots, New York or other parallel delivery, as made by the chief producer, are 40@45c. per lb. for large orders, according to size of order and terms. For small lots, 50@65c. is charged.

Platinum—Demand is strong and steady. Prices are unchanged, $26 per ounce in New York. From $20 to $23 per ounce is paid for scrap platinum.

Quicksilver—The metal is firm and New York prices are still $41 per flask of 75 lb. for lots of 100 flasks or over, and $42 for small lots down to 10 flasks. For retail quantities, under 10 flasks, pound prices are charged, which work out to about $43 per flask. San Francisco prices are firm at $39.50 for domestic orders and $38 for export. The London price is £7 5s. per flask, while jobbers are selling at £7 2s. 6d.

Aluminum—The chief producers give list prices, for ton lots and over, as follows: No. 1, over 99 per cent. pure, 36c. per lb.; No. 2, over 90 per cent., 34c. Small lots are from 1 to 3c. higher. Granulated metal is 2c. per lb. over price of ingots; rods, 1c. per lb. over ingots. Rolled sheets are 45c. per lb. up, according to size.

Minor Metals—For minor metals and their alloys, wholesale prices are, f.o.b. works:

	Per Lb.
Bismuth	$1.60@$1.60
Cadmium, 99.5% f. o. b. Hamburg	$1.62
Chromium, pure (N. Y.)	80c.
Copper, red oxide	50c.
Ferro-Chrome (70)	13c.
Ferro-Chrome (7-9% carbon, per lb. Cr.)	9@9½c.
Ferro-Chrome (1% C. for ea. 10% Cr.)	10@10½c.
Ferro-Chrome (60-64% Cr., 3-4% C.)	14c.
Ferro-Chrome (60-70% Cr., 1% C. or less)	38c.
Ferro-Molybdenum (50%)	95c.
Ferro-Titanium (20%)	80c.
Ferro-Tungsten (37%)	28c.
Ferro-Vanadium (25-50% per lb. vanadium contents)	$7.20@$7.50
Magnesium, pure (N. Y.)	1.50
Manganese, pure (98@99%) N.Y.	75c.
Manganese—Copper (30@70%) N. Y.	45c.
Molybdenum (98@99%, N.Y.)	$1.70
Phosphorus, foreign red (f.o.b. N. Y.)	1.10
Phosphorus, American yellow (f. o. b. Niagara Falls)	50c.
Tungsten (best) pound lots	85c.
Ferro-Silicon (50%) spot. Ex ship Atlantic ports	$93@$95 ton.

Variations in price depend chiefly on size and conditions of orders.

Missouri Ore Market.

JOPLIN, July 21.

The highest price reported paid for zinc was $48 per ton, on an assay basis of $45, ranging down to $42 per ton of 60 per cent. zinc. The average price was $43.74 per ton, an advance of $2, owing to a shortage of silicate sales.

The highest price reported paid for lead was $78.50 per ton, in the case of particularly sharp competition for one bin of ore. Prices were generally from $72 to $5 per ton. The average price was $74.90.

Sharp competition marked the zinc market as well as the lead market. One purchasing agency sampled and made a price offering on over 800 tons more than was purchased, the ore going to other agencies on a slightly higher price. A low average output for June and July has made zinc ore scarce, and indications point to at least two more weeks of firm prices, when it is expected the output will be materially increased by new mills soon to be brought into commission.

Following are the shipments of zinc and lead from the various camps of the district for the week ending today:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	2,367,980	553,470	$74,033
Joplin	2,659,560	318,800	73,115
Galena-Empire	1,791,880	182,510	45,369
Duenweg	664,880	111,390	19,209
Alba	527,500	10,150	12,776
Neck City	490,770	.....	11,533
Aurora	630,470	.....	10,472
Spurgeon	330,890	42,880	8,162
Prosperity	197,240	93,080	7,927
Badger	330,890	2,740	7,875
Oronogo	313,540	16,010	7,359
Granby	410,000	25,000	7,300
Baxter Springs	242,430	36,450	6,215
Carthage	127,460	.....	2,995
Sherwood	68,690	32,460	2,831
Zincite	94,560	.....	2,222
Wentworth	65,420	.....	1,471
Totals	11,314,170	1,424,940	$300 864
30 weeks	312,374,740	43,634,230	$8,417,788

Zinc value, the week, $274,491; 30 weeks, $6,760,569.
Lead value, the week, 53,373; 30 weeks, 1,657,119.

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months; the average for zinc being based on the prices of assay basis ores carrying 60 per cent. zinc:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1905.	1906.	Month.	1905.	1906.
January	52.00	47.38	January	61.50	75.20
February	52.77	47.37	February	57.62	72.83
March	47.40	42.68	March	57.20	73.75
April	42.88	44.63	April	58.00	75.13
May	43.31	40.51	May	58.27	78.40
June	40.75	43.83	June	57.80	80.96
July	43.00	43.25	July	58.00	74.31
August	48.83	....	August	58.00	....
September	46.75	....	September	63.50	....
October	47.60	....	October	63.86	....
November	49.55	....	November	68.67	....
December	49.00	....	December	76.25	....

Wisconsin Ore Market.

PLATTEVILLE, July 28.

The different camps of the Platteville district loaded ore as follows during the week:

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur, Lb.
Platteville	394,260	.....	.....
Linden	300,040	.....	.....
Cuba City	202,616	.....	.....
Benton	185,800	.....	.....
Rewey	116,000	39,000	.....
Buncombe & Hazel Green	71,800	.....	.....
Highland	63,700	.....	.....
Livingston	53,000	.....	.....
Harker	46,630	.....	.....
Total for week	1,433,864	39,000	.....
Year to July 28	38,284,866	1,984,140	3,369,980

Very little lead ore and no sulphur ore are included in the shipments for the week.

Mining Stocks.

NEW YORK, Aug. 1.

The advance started last week was kept up fairly well, but with a little recession at the close. The whole movement, however, is so plainly managed from the inside, that it is hardly worth serious comment. The public is too busy with other matters to have much influence on the exchanges just now.

Amalgamated Copper turned par again, selling up to $101, and closing at $100¼. On the curb there was some activity in copper stocks, following the lead of the general market. On the whole, it may be said that the stock market for the week was wholly lacking in significance.

The directors of the United States Steel Corporation today declared a dividend of 1 per cent. on the common stock, in addition to the regular 1¾ per cent. on the preferred. This dividend is for the first and second quarters of 1906, and is payable Oct. 1. The announcement was not made until after the close of business, and therefore had no effect on the trading in the stock, which closed at $40 per share.

Boston. July 31.

Mining shares are again looking up in sympathy with the general stock-market conditions. Up to Friday of last week the market was in the dumps, but it has since taken on a new lease of life and prices are up materially from a week back. Amalgamated, for instance, is up to $101.50 ex-dividend, against the close a week ago at $97 with the dividend on, or a net rise of $6.25. Utah Consolidated was one of the first to move up and rose $4.50 to $58.50, closing tonight not quite $1 below this. Increased dividend payments are looked for later in the year. Osceola has risen $4 to $106 on the same expectation and Tamarack is up $8.50 to $102. Wolverine rose $10 today to $153, which is its record price. Quincy has advanced $4.50 to $89.

Butte Coalition has come in for a little attention and is up $2.75 to $32.75. North Butte has advanced over $5 to $90.75 on expectations that its dividend will also be increased. Copper Range closes the week tonight $4 better at $74, and Greene Consolidated is up $2.37½ to $22.62½. Boston Consolidated is credited with a $2 advance, touching $26.25 tonight; Bingham touched $31.25, but closed tonight at $30, against $28 a week ago. Allouez has advanced $2.50 to $34.50; Centennial $1.50 to $23; Franklin $1.15 to $17.50; Isle Royale $4 to $20.50 on small buying; Mohawk $1.50 to $62.50; Parrot $1.75 to $26.75.

United Copper has been heavy for the greater part of the week, although it closes $1.62½ better than a week ago at $63. United States Smelting sold at $3.25 to $57, and Trinity spurted $1.37 to $9.37. Mass is up $1.12½ to $8 and Michigan is fractionally higher at $13.25. Arizona Commercial has been active on the curb at from $37.50 to below $36. Raven spurted to $1 today on the curb, with heavy trading in the stock.

Colorado Springs. July 27.

The local mining market did not show as much activity during the past week as for some time previous, and the tendency was to lower prices. Acacia, Doctor-Jack Pot and Work were among the more active traders. It is reported that, instead of the deep drainage tunnel as planned, the majority of the mines are in favor of one of less depth and which will drain to 750 instead of 1100 ft. This could be completed much sooner than the deeper adit.

Commencing Monday, July 30, the Colorado Springs Exchange will deal in the following listed industrials: Colorado Telephone; United States Sugar and Land; Denver Gas & Electric; Denver Tramway; Denver Tramway Power; Colorado Springs Electric; Cripple Creek Short Line; Denver Union Water; United States Reduction.

San Francisco. July 26.

The stock market continues unsteady, with rather a small range of dealings, especially in the Comstocks. Brokers hope that there will be more inquiry when the present flood of assessments has passed over, and matters have adjusted themselves a bit. The Tonopah stocks are in fair demand, and prices are well maintained. There is practically nothing doing in oil stocks.

STOCK QUOTATIONS.

NEW YORK. Week July 31

Name of Company.	High	Low	Clg.	Sales
Amalgamated*	101¾	97⅞	101½	365,710
Anaconda*	254	245½	253½	132,700
British Col. Copper	8	7⅞	7⅞	5,600
Butte Coalition	32⅝	29⅜	32⅝	11,400
Cum. Ely Mining	7¼	7	7¼	7,150
Greene Gold	2⅝	2⅜	2⅜	125
Greene Gold & Silver	1⅞	1⅝	1⅝	5,050
Guanajuato	5¾	5	5¼	4,105
Micmac	5⅜	4¾	5¼	6,375
Mines Co. of Am	1.25	1.20	1.23⅞	7,800
Mitchell Mining	4¾	4¼	4¼	3,020
Mont. Sho. Con. (New)	12¾	10⅜	12¼	2,510
Nev. Utah M. & S.	4¼	3	4	28,610
Nipissing Mines	5¾	5¼	5¼	12,000
Tennessee Copper	40	39¼	40	500
Union Copper	1⅛	1⅛	1⅛	2,750
Utah Apex	5¾	5⅛	5⅛	420

NEW YORK INDUSTRIALS.

Am. Smelting & Ref.	153¼	145⅝	153	190,850
Am. Smelt. & Ref., Pf.	118⅝	117	117	1,504
Bethlehem Steel	22½	22	22	1,400
Colo. Fuel & Iron	55⅛	48⅝	55	132,300
Federal M. & S., Pf.*	96⅛	94	95¾	3,500
Inter. Salt	33	32	32	....
National Lead	80¼	74	79¾	48,960
National Lead, Pf	101¾	101¼	101¾	2,300
Pittsburg Coal	16⅞	14⅜	16⅞	1,550
Republic I. & S.	29⅛	26¼	28⅜	11,600
Republic I. & S., Pf.	99¼	96	99⅛	4,600
Sloss-Sheffield	75¾	71⅛	75¾	9,000
Tenn. C. & I*	156	151¾	156	3,200
U. S. Red. & Ref	38	36	37⅛	2,700
U. S. Red. & Ref., Pf.	76⅞	75	76½	900
U. S. Steel	40	35¼	40	553,830
U. S. Steel, Pf.	107½	103¼	107	142,410
Va. Car. Chem	37¼	34½	37¼	17,000

* Ex. div.

BOSTON.

Adventure	6¼	6	6¼	475
Allouez	34½	31⅜	34½	990
Atlantic	14⅞	14	14	1,975
Bingham	30¼	28	30	3,220
Boston Consolidated	27	24½	26¼	4,715
Calumet & Arizona	111	110	110	476
Calumet & Hecla	690	685	690	47
Centennial	23	21½	22¾	724
Copper Range	74½	70¾	74	5,373
Daly-West	17¾	16¾	17¾	899
Franklin	17¾	16¾	17½	3,765
Granby	12	10⅞	11⅞	260
Greene Consolidated	22¾	20¾	22¾	8,513
Isle Royal	20½	18½	19¾	1,258
Mass	8	6¾	8	455
Michigan	13¾	12¾	13	940
*Mohawk	62½	61	62¾	1,715
Mont. Coal & Coke rcts.	2⅜	2⅜	2⅜	210
Nevada	19	17½	18¾	3,190
North Butte	90¾	85	90	8,861
Old Dominion	39¼	37	38¾	905
Osceola	106	103	106	2,233
Parrot	27	25½	26¾	1,210
Quincy	89	84¾	87½	415
Rhode Island	4	4	4	135
Shannon	9¾	9¼	9¾	5,268
Tamarack	102	94	102	15
Tecumseh	10⅜	9½	10¼	135
Trinity	9⅜	8½	9	7,067
United Copper, com.	63¾	61½	63½	3,985
U. S. Oil	10⅞	9¾	10⅞	155
U. S. Smg. & Ref.	57½	54	57	3,792
U. S. Smg. & Ref., pfd.	45¾	44	45½	1,630
Utah Copper	58¾	54	57⅞	7,681
Victoria	6¾	6⅜	6½	640
Winona	8	7	7¾	1,594
Wolverine	153	143	153	714

These stocks, not elsewhere quoted, had the following range of prices during the week: (New York) Am. Agri. Chem., 25½—22½; Gold Hill, 3½—2½; Comstock, .14; Gugg. Exp., 226—225; Prec. Metals Co., 5¾; StandardOil, 609—599. (Boston) Ahmeek, 80—75; Ariz. Com'l., 37—35; Black Mt., 11—7¾; East Butte, 9½—9; Keweenaw, 9½—9; Majestic, 1½—1; Raven, .93—.80; Shawmut, 1; Superior & Pitts., 17½—15; Troy, 1½—1½.

PHILADELPHIA. July 31.

Name of Company.	High	Low	Clg.	Sales.
American Cement	6¾	6¾	6¾	430
Cambria Steel	35⅞	34⅛	35⅛	3,837
General Asphalt	9	9	9	10
Penn. Steel, pd	106	106	106	94
Philadelphia Co.	49¾	49	49	105
Tonopah Mining	18¾	18	18	4,033

PITTSBURG. July 31.

Crucible Steel	12¾	11¾	12¾	2,847
Crucible Steel, Pf.	78¼	76¼	78	1,672
Harbison-Walker Ref.	11	11	11	100
Ohio Tonopah	.28	.26	.28	1,025
Tonopah Ext.	6	5¼	5⅝	3 835

COLORADO SPRINGS. July 28.

Name of Company.	High	Low	Clg	Sales
Acacia	14¼	13⅞	14	25,000
C. C. Con	6⅝	6⅞	6⅝	....
Doctor Jack Pot	8⅝	8¾	8¾	20,000
Elkton	47½	46¾	47	6,400
El Paso	44	42½	44	4,300
Findley	75¾	74	74	8,000
Gold Dollar	8¼	8	8	10,500
Gold Sovereign	6⅞	6⅜	6⅞	....
Isabella	22¾	22⅜	22¾	4,500
Jennie Sample	9¼	8⅝	9	11 000
Mary McKinney	49	46¾	46½	2,600
Portland	1.47¾	1.43½	1.45	2,800
United Gold Mines	10	9¾	9⅞	....
Vindicator	93	93	93	....
Work	13	12½	12½	25,000

SAN FRANCISCO. July 26.

Name of Company.	High	Low	Clg	Sales
Best & Belcher	.72	.70	.70	300
Caledonia	.30	.24	.24	2,200
Challar	.12	.10	.10	1,100
Con. Cal. & Va	.92	.86	.87	1,850
Crown Point	.11	.10	.10	1,100
Gould & Curry	.08	.07	.07	3,200
Hale & Norcross	.96	.91	.91	1,500
Mexican	.74	.67	.70	5,150
Ophir	3.55	3.45	3.45	1,450
Overman	.12	.12	.12	300
Potosi	.13	.11	.13	2,000
Savage	.72	.67	.67	2,800
Sierra Nevada	.22	.19	.20	2,700
Bullfrog Mining	.38	.35	.38	4,900
Diamondfield	.36	.31	.35	24,500
Goldfield of Nevada	.38	.38	.38	
Jim Butler	1.12	1.05	1.12	3,500
Kendall	.54	.51	.54	2,900
MacNamara	.81	.68	.70	17,100
Manhattan Dexter	.45	.42	.45	3,900
North Star	.45	.42	.42	8,200
Original Bullfrog	.14	.13	.13	11 400
Tonopah Belmont	5.37	4.75	5.25	6,300

Tonopah Stocks July 25.

(Revised by Weir Bros. & Co., New York.)

	High.	Low.	Last.
Tonopah Mine of Nevada	18 25	17.87½	18.25
Tonopah Montana	2.76	2.72	2.76
Tonopah Extension	5.62½	5.50	5.50
Tonopah Midway	2.20	2.19	2.20
Tonopah West End	2.55	2.50	2.55
Goldfield Mining Co.	.36½	.36	.36½
Jumbo Mining	1.11	1.10	1.10
Red Top	1.18	1.18	1.18
Sandstorm	.48	.47	.48
Montgomery Shoshone Cons	11.75	11.75	11.75

St. Louis. July 28.

Adams, $0.40—$0.25; American Nettie, $0.15—$0.12; Center Creek, $2.20—$2.00; Central Coal and Coke, $63.25—$62.00; Central Coal and Coke, pfd., $78.00—$76.00; Central Oil, $60.00—$45.00; Columbia, $5.00—$2.00; Con. Coal, $22.00—$19.50; Doe Run (old stock), $350.00—$300.00; Granite Bimetalic, $0.21—$0.18; St. Joe (old stock), $32.00—$30.00.

LONDON. (*By Cable.**) Aug. 1.

Dolores, £1 18s. 9d.; Stratton's Independence, £0 4s. 0d.; Camp Bird, £1 4s. 0d.; Esperanza, £3 11s. 3d.; Tomboy, £1 5s. 0d.; El Oro, £1 10s. 0d.; Oroville, £0 16s. 6d.; Somera, £0 5s. 7½d.; Utah Apex, £1 3s. 9d.

*Furnished by Hayden, Stone & Co., New York.

New Dividends.

Company.	Payable.	Rate.	Amt.
Amalgamated Copper	Aug. 27	1.75	1,712,500
Am. Smelters' Sec. pfd. B	Sept 1	1.25	375,000
Cambria Steel	Aug. 15	0.65	675,000
General Chemical	Sept. 1	2.00	148,206
Iron Silver	Oct. 1	0 20	100,000
Jeffers'n & Cl'rf'ld C. & I., pfd.	Aug. 15	2.50	45,000
Kendall, Mont.	July 23	0.03	15,000

Assessments.

Company.	Delinq.	Sale.	Amt.
Belcher, Nev	July 18	Aug. 8	$0.10
Con. Imperial, Nev	Aug. 1	Aug. 28	0.01
Morrison, Utah	Aug. 14	Sept. 3	0.01
Mountain Lake, Utah	Aug. 15	Sept. 10	0.01
Mt. Pleasant, Cal	Aug. 22	Sept. 12	0.03
Old Col. & Eureka, Utah	July 26	Aug. 13	0.001
Potosi, Nev	July 16	Aug. 6	0.10
Quincy Junior, Utah	July 25	Aug. 15	0.10
Savage, Nev	Aug. 10	Aug. 31	0.10
Spider, Utah	Aug. 20	Sept. 15	0.00½
Union, Nev	Aug. 15	Sept. 5	0.10
Utah, Nev	July 18	Aug. 8	0.10
Wasa, Utah	Aug. 11	Sept. 1	0.00½

Monthly Average Prices of Metals.

SILVER.

Month.	New York.		London.	
	1905.	1906.	1905.	1906.
January	60.690	65.288	27.930	30.113
February	61.023	66.108	28.047	30.464
March	58.046	64.697	26.794	29.854
April	56.600	64.765	26.108	29.984
May	57.832	66.976	26.664	30.958
June	58.428	65.394	26.910	30.185
July	58.915	65.105	27.163	30.113
August	60.259	.. ..	27.822	.....
September	61.496	.....	28.528	.....
October	62.034	.....	28.637	.....
November	63.849	.....	29.493	.....
December	64.850	.....	29.977	.....
Year	60.352	.....	27.839	.....

The New York prices are in cents per fine ounce; the London quotation is in pence per standard ounce, .925 fine.

COPPER.

	NEW YORK.				LONDON.	
	Electrolytic.		Lake.			
	1905.	1906.	1905.	1906.	1905.	1906.
Jan	15.008	18.310	15.128	18.416	68.262	78.896
Feb	15.011	17.869	15.136	18.116	67.963	78.147
March	15.125	18.361	15.250	18.641	68.174	81.111
April	14.920	18.375	15.045	18.688	67.017	84.793
May	14.627	18.457	14.820	18.724	64.875	84.867
June	14.673	18.442	14.815	18.719	65.881	83.994
July	14.888	18.190	15.006	18.585	66.887	81.167
Aug	15.664	.....	15.725	.....	69.830	.....
Sept	15.965	.....	15.978	.....	69.667	.....
Oct	16.279	.....	16.332	.....	71.406	.....
Nov	16.599	.....	16.758	.....	74.727	.....
Dec	18.328	.....	18.398	.....	78.993	.....
Year	15.590	.....	15.699	.....	69.465	.....

New York prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars. The London prices are in pounds sterling, per long ton of 2,240 lb., standard copper.

TIN IN NEW YORK.

Month.	1905.	1906.	Month.	1905.	1906.
Jan	29.325	36.390	July	31.760	37.275
Feb	29.262	36.403	August	32.866	.....
March	29.523	36.662	Sept	32.095	.....
April	30.525	38.900	Oct	32.481	.....
May	30.049	43.313	Nov	33.443	.....
June	30.329	39.260	Dec	35.835	.....
			Av. year.	31.358	.....

Prices are in cents per pound.

LEAD IN NEW YORK.

Month.	1905.	1906.	Month.	1905.	1906.
Jan	4.552	5.600	July	4.524	5.750
Feb	4.450	5.464	Aug	4.665	.....
March	4 470	5.350	Sept	4.850	.....
April	4.500	5.404	Oct	4.850	.....
May	4.500	5.685	Nov	5.200	.....
June	4.500	5.750	Dec	5.422	.....
			Av., year.	4.707	.....

Prices are in cents per pound. The London average for January, 1906, was £ 16.850 per long ton; February, £ 16.031; March, £ 15.922; April, £ 15.859; May, £ 16.725; June, £16.813; July, £16.525.

SPELTER.

Month.	New York.		St. Louis.		London.	
	1905.	1906.	1905.	1906.	1905.	1906.
Jan	6.190	6.487	6.032	6.337	25.062	28.225
Feb	6.139	6.075	5.989	5.924	24.594	25.844
Mar	6.067	6.209	5.917	6.056	23.825	24.563
April	5.817	6.078	5.667	5.931	23.813	25.781
May	5.434	5.997	5.284	5.846	23.594	27.000
June	5.190	6.096	5.040	5.948	23.875	27.406
July	5.396	6.006	5.247	5.856	23.938	26.800
Aug	5.706	.....	5.556	.....	24.675	.....
Sept	5.887	.....	5.737	.....	26.375	.....
Oct	6.087	.....	5.934	.....	28.225	.....
Nov	6.145	.....	5.984	.....	28.500	.....
Dec	6.522	.....	6.374	.....	28.719	.....
Year	5.882	.....	5.730	.....	25.483	.....

New York and St. Louis prices are in cents per pound. The London prices are in pounds sterling per long ton (2,240 lb.) good ordinary brands.

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

ABRASIVES—		
Bort, nominal	carat,	$25 to $75 & up.
Carborundum, f.o.b. Niagara Falls, powd	lb.	.08
Grains	"	.10@.17
Corundum	"	.07@.10
Crushed Steel, f.o.b. Pittsburg	"	.05¾@.06
Emery, in kegs: Turkish flour	"	.03½
Grains	"	.05@.05½
Naxos flour	"	.03½
Grains	"	.05@.05½
Chester flour	"	.03½
Grains	"	.05@.05½
Peekskill, f.o.b. Easton, Pa., flour	"	.01½
Grains, in kegs	"	.02½
Garnet, per quality	sh. ton	25.00@35.00
Pumice Stone, Am. Powd.	lb.	.01¾
Italian, powdered	"	.01¾
Lump, per quality	"	.03@.20
Rottenstone, ground	"	.01½
Lump, per quality	"	.03@.08
Rouge, per quality	"	.10@.30
Steel Emery, f.o.b. Pittsburg	"	.07½@.07¾
ACIDS—		
Acetic 28%	lb.	.02¼@.02¾
Boric	"	.10@.11
Hydrofluoric, 30%	"	.03
" 48%	"	.06
" 60%	"	.10½
Hydrochloric acid, 20°, per lb		1.25@1.50
Nitric acid, 38°	per lb.	4.25@4.62½
Sulphuric acid, 50°, bulk, per ton		$12 up.
60°, 100 lb. in carboys		.87½@1.12½
60°, bulk, ton		16.00@20.00
66°, 100 lb. in carboys		1.00@1.25
66°, bulk, ton		18.00@21.00
Oxalic	"	.06@.06½
ALCOHOL—Grain	gal.	2.46½
Refined wood, 95@97%	"	.70@.75
ALUM—Lump	100 lb.	$1.75
Ground	"	$1.80@1.85
Chrome Alum	lb.	0.05
ALUMINUM—Sulphate, com'l.	"	1.25@1.60
AMMONIA—24 deg.	lb.	.04½@.05½
" 26 "	"	.04¾@.05¾
AMMONIUM—		
Bromide	lb.	.23
Carbonate	"	.08¼
Muriate grain	"	.06
Lump	"	.09½
Sulphate, 100 lb		$3.05@$3.12½
Sulphocyanide com.	"	.30
" " chem. pure	"	.40
ANTIMONY—needle, lb		14@16c.
ARSENIC—White (nominal)	"	.05@.05½
Red	"	.06½@.07½
ASPHALTUM—		
Barbadoes	per ton.	40.00@100.00
West Indies	"	20.00@60.00
Egyptian	lb.	.09@.10
Gilsonite, Utah ordinary	per ton.	40.00@60.00
Trinidad	"	25.00@30.00
California	"	18.00@24.00
BARIUM—		
Carb. Lump, 80@90%	sh. ton.	28.00
92@98%	"	30.00
Powdered, 80@90%	lb.	.02@.02½
Chloride com'l	ton.	$36.00
Nitrate, powdered, in casks	lb.	.06
Sulphate (Blanc Fixe)	"	.02
BARYTES—		
Am. Ground	sh. ton.	12.00@21.00
Floated	"	19.50@21.00
Foreign floated	"	19.00@21.00
White	"	17.00@19.00
BISMUTH—Sub-nitrate	lb.	1.50
BLEACHING POWDER—35%, 100 lb.		$1.25@1.50
BLUE STONE—(copper sulphate), carload, per lb		.06½@.06¾
BONE ASH	lb.	.02½@.02½
BORAX	"	.07½@.07½
CALCIUM—Acetate, gray	"	2.35@2.40
Acetate, brown	"	1.60@1.65
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J.	sh. ton.	65.00
Chloride, f.o.b. works	"	8.00@12.00
CEMENT—		
Portland, Am. 500 lb.	bbl.	1.55@1.60
Foreign	"	1.60@2.00
"Rosendale," 300 lb.	"	.85
(in sacks)		.65
Slag cement	"	.75@1.25
CHROME ORE—		
(50%) ex-ship N. Y.	lg. ton.	20.00
Bricks, f.o.b. Pittsburg, M.	"	175.00
CLAY, CHINA—Am. common ex-dock, N. Y.	"	$8 up.
Foreign	"	12.00@18.00
COBALT—Oxide	lb.	2.50
COPPERAS—Bulk	100 lb.	$0.47½
In bbls	"	.57½@.67½
In bags	"	.52½@.62½
CRYOLITE	lb.	.06½
FELDSPAR—Ground best	sh. ton.	15.00@20.00
Common		10.00@12.00
FIRE BRICK.		
American	per M.	20.00@30.00
Imported	"	30.00@45.00
St. Louis No. 1	"	16.00
" No. 2	"	14.00
Extra	"	20.00@23.00
FIRE CLAY.		
St. Louis mill	per ton	2.50
FLUORSPAR—		
Domestic f.o.b. shipping port:		
Lump	sh. ton.	8.00@10.00
Ground	"	11.50@13.50
Gravel	"	4.25@4.50
Foreign crude ex. dock		8.00
FULLER'S EARTH—Lump	100 lb.	.75@.90
Powdered	"	.80@1.25
GRAPHITE—		
American, ore, common	lb.	.01@.10
Artificial	"	.06
Ceylon, common pulv	"	.02½@.03½
Best, pulverized	"	.04@.06
German, com. pulv	"	.01½@.01½
Best, pulverized	"	.01½@.02
Italian, pulverized	"	.01@.02
GYPSUM—		
Fertilizer	"	7.00
Rock	lg. ton.	4.00
English and French	"	18.00@22.50
INFUSORIAL EARTH—		
Ground Am. best	"	39.00
French	"	56.00
German	"	56.00@59.00
LEAD—Acetate (sugar of)	lb.	.07½@.09½
Nitrate, com'l	"	.07½@.08
MAGNESITE—Greece.		
Crude (95%)	lg. ton.	7.00@8.00
Calcined	sh. ton.	30.00@40.00
Bricks, domes, per qual. f.o.b. Pittsburg	M.	160@200
MAGNESIUM—		
Chloride, com'l	lb.	.01@.01½
Sulphate (Epsom salt)	100 lb.	.80@1.10
MANGANESE—		
Crude powdered:		
70@75% binoxide	lb.	.02
75@85% binoxide	"	.02½
85@90% binoxide	"	.03½
90@95% binoxide	"	.05½
Ore, 80%–90%	sh. ton.	35.00@45.00
MARBLE—Flour	sh. ton.	8.50@9.00
MINERAL WOOL—		
Slag, ordinary	"	19.00
Selected	"	25.00
Rock, ordinary	"	32.00
Selected	"	40.00
MONAZITE SAND—		
Guar. 97%, with 5% Thorium oxide, nominal	lb.	.14@.15 and up.
NICKEL—		
Oxide, crude, lb. (77%) for fine metal contained		.47
Sulphate, single	lb,	.18@.20
" double	"	.10½@.12
NITRATE OF SODA—100 lb. 96% for 1906		2.50@2.55
95% for 1907		2.40
95% for 1908		2.30
96% is 7½c higher per 100 lb.		
OZOKERITE—best	lb.	.14
PAINTS AND COLORS—		
Litharge, Am. powdered	"	.07½@.07½
English glassmakers'	"	.08½@.08½
Lithopone	"	.03½@.07
Metallic, brown	sh. ton.	19.00
Red	"	16.00
Ocher, Am. common	"	8.50@9.00
Best	"	16.00
Dutch, washed	lb.	.02½@.03
French, washed	"	.01½@.02½
Paris green, pure, bulk	"	.21@.23
Red lead, American	"	.07½@.07½
Foreign	"	.08½@.08½
Turpentine, spirits	gal.	.62@.63
White lead, Am., dry	lb.	.06½@.06½
American, in oil	"	.07@.07½
Foreign, in oil	"	.09½@.09½
Zinc white, Am. extra dry	"	.05½@.05½
Foreign, red seal, dry	"	.07½@.07½
Green seal, dry	"	.07½@.08½
PHOSPHATES—Acid	.65@67½c	per unit
*Fla., hard rock		$8.00@8.25
land pebble		4.50@5.00
†Tenn., 78@80%		4.60@4.75
78%		4.00@4.25
75%		4.00@4.50
68@72%		3.25@3.75
‡So. Car. land rock		4.00@4.25
" " river rock		3.75@4.00
POTASSIUM—		
Bicarbonate crystal	lb.	$0 08½
Powdered or granulated	"	.14
Bichromate, Am	"	.08½@.09½
Scotch	"	.11
Bromide	"	.16
Carbonate (80@85%)	"	.03½
Caustic, ordinary	"	.04½
Elect. (90%)	"	.05½
Chloride (muriate), lb		1.9@1.98c.
Chlorate, powdered	"	.08½
Crystals	"	.08½
Cyanide (98@99%)	"	.18@.19
Kainite, long ton, bulk, $8.50; bags, $9.50.		
Permanganate	lb.	.09
Prussiate, yellow	"	.15½
Red	"	.33
Sulphate	100 lb.	2.18½@2.21½
PYRITE—		
Domestic, non-arsenical, furnace size	per unit	11@11½c.
Domestic, non-arsenical, fines, per unit		9@10½c.
Imported non-arsenical, furnace size, per unit		13c.
Imported, arsenical, furnace size, per unit		12@12½c.
Imported fines, arsenical, per unit		8½@9c.
" " non-arsenical, per unit		10½@11c.

Pyrite prices are per unit of sulphur. An allowance of 25c. per ton is made when delivered in lump form.

SALT—N. Y. com. fine 280 lb. bbl.		.72@1.15
N. Y. agricultural	sh. ton.	$3@4.40
SALTPETER—Crude	100 lb.	5.00
Refined, crystals	"	8.00
SILICA—		
Ground quartz, ord'ry	sh. ton	12.00@15.00
Best	"	30.00@40.00
Lump Quartz	"	2.50@4.00
Glass sand	"	2.75
SILVER—Nitrate, crystals	oz.	.41½@.44
SODIUM—		
Acetate	lb.	.04¼@.04½
"Alkali," per lb., future 58%		.95@1.12½c
" " " prompt		1.00@1.20c.
Bicarb. soda, per lb		1½@1½c.
Soda, caustic, per lb., 78%		1.8@2c.
" " powdered		3c.
Salt cake, per 100 lb		65c.
Sal soda, per lb		7c.
Soda, monohydrate, per lb		1½c.
Bichromate	lb.	.06½@.06½
Bromide	"	.16
Chlorate, com'l	"	.08½
Cyanide, ("100% KCN")	"	.18@.19
Hyposulphite, Am	"	1.50@1.75
German	"	1.75@2.00
Phosphate	100 lb.	1.85 up.
Prussiate	"	.09
Sal soda, f.o.b. works	100 lb.	.60
Foreign, f.o.b. N. Y.	"	.75
Silicate, com'l	100 lb.	.75@1.00
Sulphate, com'l, (Glauber's salt)	100 lb.	.40 up.
" " calcined		.65@.80
STRONTIUM—Nitrate	lb.	.07¾
SULPHUR—		
Louisiana (prime) to New York, Boston or Portland	ton	$20.00
To Philadelphia or Baltimore	"	20.50
Roll	100 lb.	1.85@2.15
Flour	" "	2.00@2.40
Flowers, sublimed	" "	2.20@2.60
TERRA ALBA—	100 lb.	.60@1.00 & up.
TALC—Domestic	sh. ton.	15.00 and up
French, best	"	25.00
Italian, best	"	35.00 and up
TIN—Bi-chloride, 50%	lb.	11½c.
Crystals	"	24½@26½c.
Oxide, lb		50c.
URANIUM—Oxide	"	3.50
ZINC—Metallic ch. pure	"	.15
Chloride solution, com'l	"	.02½@.02½
Chloride, granular	"	.04½
Dust	"	.05½
Sulphate	"	.02½

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

Note—These quotations are for wholesale lots in New York, unless otherwise specified, and are generally subject to the usual trade discounts. Readers of THE ENGINEERING AND MINING JOURNAL are requested to report any corrections needed, or to suggest additions which they may consider advisable.

DIVIDENDS.

Metal and Mining Companies—U. S.

Name of Company and Location.		Authorized Capital	Shares. Issued.	Par Val.	Dividends. Total to Date.	Latest. Date.	Amt.
Alaska Mexican, g.	Al'ka	$1,000,000	180,000	$ 5	$1,374,381	Feb. 1906	$ .30
Alaska Treadwell, g.	Al'ka	5,000,000	200,000	25	8,535,000	Feb. 1906	1.00
Alaska United, g.	Al'ka	1,000,000	180,200	5	.....	Feb. 1906	0.40
Amalgamated, c.	Mont	155,000,000	1,530,879	100	41,309,524	Aug. 1906	1.75
Am. Sm. & Ref., com.	U. S.	50,000,000	500,000	100	7,625,000	July 1906	1.75
Am. Sm. & Ref. pf.	U. S	50,000,000	500,000	100	21,706,553	July 1906	1.75
Am. Smelters, pf. A	U. S.	17,000,000	170,000	100	765,000	Mar. 1906	1.50
Am. Smelters. pf. B	U. S.	30,000,000	300,000	100	1,500,000	June 1906	1.25
Anaconda, c.	Mont	30,000,000	1,200,000	25	28,850,000	July 1906	1.37½
Annie Laurie, g.	Utah	5,000,000	25,000	100	465,061	July 1905	.50
Arizona, c.	Ariz	3,775,000	3,682,520	.....	6,182,361	Apr. 1906	.05
Atlantic, c.	Mich	2,500,000	100,000	25	990,000	Feb. 1905	.02
B. & H., l. z.	Mo	400,000	400,000	1	40,000	Dec. 1905	.01
Beck Tunnel, g. s. l.	Utah	1,000,000	1,000,000	1	155,000	Aug. 1906	.02½
Boston & Montana.	Mont	3,750,000	150,000	25	46,075,000	Aug. 1906	12.00
Bull. Beck. & Cham. g	Utah	1,000,000	100,000	10	2,508,400	July 1906	.10
Bunker Hill & Sull.	Ida	3,000,000	300,000	10	6,786,000	July 1906	.60
Butte & Boston, c.	Mont	2,500,000	200,000	25	1,800,000	Feb. 1904	1.00
Calumet & Arizonac	Ariz	2,500,000	200,000	10	4,500,000	June 1906	3.00
Calumet & Hecla, c.	Mich	2,500,000	100,000	25	94,350,000	June 1906	15.00
Camp Bird, g. s.	Colo	5,500,000	820,000	5	3,382,500	Feb. 1906	.24
Carisa, c. g.	Utah	500,000	500,000	1	35,000	July 1906	.01
Central Eureka, g.	Cal	400,000	398,42?	1	778,921	Mar. 1906	.07
C. K. & N., g.	Colo	1,500,000	1,431,900	1	229,104	Dec. 1904	.01
Con. Mercur, g.	Utah	1,000,000	1,000,000	1	1,155,000	June 1906	.02½
Continental, z. l.	Mo	550,000	22,000	25	154,000	Apr. 1906	.50
Copper Range Con.	Mich	38,500,000	383,781	100	2,448,100	July 1906	1.25
Creede United, g.	Colo	2,000,000	1,625,000	1	214 053	July 1909	.00½
Cripple Creek Con g	Colo	2,000,000	2,000,000	1	180,000	Mar. 1905	.00½
Daly West, g. s. l.	Utah	3,600,000	180,000	20	5,283,000	June 1906	.60
De Lamar, g. s.	Ida	400.000	67,180	5	2,926,370	May 1905	.72
Dillon, g.	Colo	1,250,000	1,250,000	1	21,875	July 1905	.01
Doctor Jack Pot	Colo	3,000,000	3,000,000	1	268.000	July 1906	.00½
Doe Run, l.	Mo	10.000.000	59,962	100	933,010	May 1906	.50
Elkton Con., g.	Colo	3,000,000	2,500,000	1	1,666,960	July 1906	.00½
El Paso, g.	Colo	2,500,000	2,450,000	1	997,750	June 1906	.01
Fed. Sm., com.	Idaho	10,000,000	60,000	100	1,208,750	June 1906	4.00
Federal Sm., pf.	Idaho	20,000,000	120,000	100	2,021,250	June 1906	1.75
Findley, g.	Colo	1,250,000	1,250,000	1	312,500	July 1906	.01
Gemini-Keystone	Utah	500,000	5 000	100	1,800,000	Apr. 1906	10.00
Gold King Con	Colo	5,750,370	5,750,370	1	1,407,504	May 1905	.01
Gold Sovereign	Colo	2,000,000	2,000,000	1	10,000	Jan. 1905	.00½
Grand Central, g.	Utah	250,000	250,000	1	1,101,250	July 1906	.06
Gwin Mine, Dev., g.	Cal	1,000,000	100,000	10	35,000	Mar. 1906	.25
Hecla, s. l.	Idaho	250.000	1,000,000	0.25	680,000	June 1906	.06
Homestake, g.	S. D.	21,840,000	218,400	100	14,770,150	June 1906	.50
HornSilver, g. s. c. z. l	Utah	10,000 000	400,000	25	5,482,000	June 1906	.05
Inter'l Nickel, pf.	N. Y.	12,000,000	87,415	100	262,245	July 1906	1.50
Iron Silver	Colo	10,000,000	500,000	20	3,800,000	Oct. 1906	.20
Jamison, g.	Cal	3,900.000	390,000	10	235,570	Apr. 1906	.03
Jerry Johnson	Cal	2,500,000	2,500,000	1	61,700	Apr. 1906	.03
Kendall, g.	Mont	2,500,000	500 000	5	630.000	July 1906	.03
Liberty Bell, g. s.	Colo	700.000	130,551	5	110,857	Jan. 1906	.15
Lightner, g.	Cal	125,000	102,255	1	295,694	Aug. 1905	.05
Mammoth, g. s.	Utah	10,000 000	400,000	25	2,040,000	July 1906	.05
Mary McKinney, g.	Colo	1 500,000	1,304,252	1	645,254	July 1906	.03
Mohawk, c.	Mich	2,500,000	100,000	25	500,000	July 1906	3.60
Mont. Ore Purch	Mont	2,500,000	80,833	25	6 608.119	Apr. 1906	10.00
Monument, g.	Colo	300,000	300,000	1	27,124	Apr. 1905	.01
Nevada Keystone, g	Nevada	1,000,000	638,877	1	61,790	Feb. 1904	.03
New Century, z. l.	Mo	150,000	150,000	1	25,500	July 1906	.01
New Idria, q.	Cal	500,000	100,000	5	840,000	July 1906	.20
New Jersey, z.	U. S.	10,000,000	100,000	100	8,400,000	Feb. 1906	3.00
North Butte	Mont	6,000,000	400,000	15	1,800,000	May 1906	2.00
North Star, g.	Cal	2,500,000	250,000	10	1,136,989	July 1906	.20
Northern Light, g. s	Utah	2,000,000	400,000	5	20,000	Feb. 1904	.05
Old Dominion Cop.	Ariz	7,500,000	281,589	25	280,843	May 1906	.50
Old Gold	Colo	2,101,150	2,101,150	1	10,506	Mar. 1906	.05
Ophir, g. s.	Nevada	302,400	100,800	3	1,797,400	July 1904	.25
Osceola, c.	Mich	2,500,000	96,150	25	5,785,700	July 1906	6.00
Parrot, c. s.	Mont	2,300,000	229,850	10	5,520,337	June 1906	.25
Pennsylvania, g.	Cal	5,150,000	51,500	100	284,925	July 1905	.10
Platteville, l. z.	Wis	20,000	500	40	89,500	Oct. 1905	10.00
Portland, g.	Colo	3,000,000	3,000,000	1	7,267,086	July 1906	.05
Quicksilver, pf.	Cal	4,500,000	43,000	100	1,931,411	May 1903	.50
Quilp, g.	Wash	1,500,000	1,500,000	1	15,000	Apr. 1904	.01
Quincy, c.	Mich	2,500,000	100,000	25	15,720,000	Feb. 1906	5.00
Red Bird, g. s. c. l.	Mont	1,500,000	300,000	5	72,000	Dec. 1904	.01
Rob Roy, z.	Mo	15,000	15,000	1	9,600	May 1906	.03
Rocco Homest'k l. s.	Nevada	300,000	300,000	1	112,000	Dec. 1905	.02
Sacramento, g. q.	Utah	5,000,000	1,000,000	1	235,000	July 1906	.00½
Salvator, g. s. l.	Utah	200.000	200,000	1	6,500	Aug. 1904	.01
St. Joseph, l.	Mo	20,000,000	1,000.000	10	4,658,357	June 1906	.15
Silver Hill, g. s.	Nevada	108,000	108,000	1	59,400	Feb. 1906	.05
Silver King, g. s. l.	Utah	3,000,000	150,000	20	10,225,000	May 1906	.33½
Spearfish, g.	S. D.	1,500,000	1,500,000	1	165,500	Jan. 1905	.01½
Standard Con., g. s.	Cal	200,000	178,394	10	4,178,174	Feb. 1906	.10
Stratton's Independ	Colo	5,500,000	1,000,007	5	4 895,865	Apr. 1906	.12½
Tamarack, c.	Mich	1,500,000	60,000	5	9,000,000	July 1906	2.00
Tennessee, c.	Tenn	5,000,000	175,000	25	875,000	July 1906	1.25
Tomboy, g. s.	Colo	1,750,000	300,000	5	900.000	June 1906	.48
Tonopah of Nev.	Nevada	1,000,000	1,000,000	1	1,950,000	July 1906	.35
Tonopah Belmont	Nevada	2,000,000	1,295,007	1	129,500		.10
Tonopah Ext'nsion	Nevada	1,000,000	928,433	1	278,530	Apr. 1906	.15
Tonopah Midway	Nevada	1,000,000	1,000,000	1	200,000	July 1906	.05
Uncle Sam, g. s. l.	Utah	500,000	500,000	1	115.000	July 1906	.01
United Cop. Com	Mont	75,000,000	450,000	100	2,812,500	July 1906	1.75
United, c. pf.	Mont	5,000,000	50,000	100	1,200,000	May 1906	3.00
United, z. l, com	Mo	5,000,000	92,400	5	27,450	Oct. 1903	.05
United, z. l., pf.	Mo	1,000,000	19,556	25	197,064	July 1905	.50
United, (Crip'le C'k)	Colo	5,000,000	4,009,100	1	280,071	Apr. 1905	.00½
United Verde, c.	Ariz	3,000,000	300,000	10	17,085,322	Dec. 1904	.75
Un. States, pf. g. s. c. l*	Utah	37,500,000	750,000	50	1,312,500	July 1906	.87½
Utah, g.	Utah	1,000.000	100,000	10	228.000	May 1906	.01
Utah Con., c.	Utah	1,500,000	300,000	5	5,136,000	July 1906	2.50
Victoria, Utah	Utah	250,000	250,000	1	57,000	July 1906	.04
Vindicator Con., g.	Colo	1,500,000	1,500,000	1	1,470,000	July 1906	.03
Wolverine, c.	Mich	1,500,000	60,000	25	3,390,000	July 1906	8.00
Work, g.	Colo	1,500,000	1,500,000	1	30,000	July 1906	.01
Yankee Con.	Utah	500,000	500,000	1	112 500	June 1906	.02½

*Previous to consolidation $1,436,250 were divided.

Coal, Iron and Other Industrials—United States.

Name of Company and Location.		Authorized Capital.	Shares. Issued.	Par Val. $	Dividends. Total to Date.	Latest. Date.	Amt.
Ala. Con., C. & I., pf.	Ala	$2,500,000	24,638	100	$905,265	May 1905	$1.75
Allis-Chalmers, pf.	U S	25,000,000	200,000	100	3,213,750	Feb. 1904	1.75
Amer. Ag. Chem., pf.	U. S	20,000,000	181,530	100	6,286,790	Apr. 1905	3.00
American Cement	Pa.	2,000,000	200,000	10	948,000	July 1906	.30
American Coal	Md	1,500,000	50,000	25	1,757,500	Mar. 1906	1.25
Associated Oil	Cal	21,000,000	21,000,000	1	630,000	Aug. 1905	.01½
Bethlehem Steel, pf.	Pa.	15,000,000	150,000	100	525.000	Feb. 1906	1.75
Bon Air C. & I., pf.	Tenn	2,500,000	18,803	100	249,757	Oct. 1904	1.50
Cambria Steel	Pa.	50,000,000	900,000	50	6,750,000	Aug. 1906	.75
Caribou Oil	Cal	100,000	80,000	1	56,000	July 1905	.07
Central C. & C., com.	Mo	5,125,000	51,250	100	1,768,125	July 1906	1.50
Central C. & C., pf.	Mo	1,875,000	18,750	100	1,218,750	July 1906	1.25
Central Oil	W. Va.	1,500,000	60,000	25	182,500	May 1904	.25
Claremont Oil	Cal	500,000	450,000	1	58,500	June 1905	.01
Col. & Hock. C. & I.	Ohio	7,000,000	69,244	100	173,086	Feb. 1905	.25
Consolidated Coal	Ill.	5,000,000	50,000	100	350,000	July 1904	1.00
Consolidation Coal	Md.	10,250,000	102,500	100	8,289,150	July 1906	1.50
Crucible Steel, pf.	Pa.	25,000,000	250,000	100	625,000	June 1906	1.50
Empire S. & I., pf.	N. J	5,000,000	25,000	100	562,500	July 1906	1.50
Fairmont Coal	W. Va.	12,000,000	120,000	100	840,000	Feb. 1906	2.00
Four Oil	Cal	500,000	300,000	1	105.406	July 1905	.01
General Chem. com.	U. S	12,500,000	74,103	100	1,896,919	Sept. 1906	2.00
General Chem., pf.	U. S	12,500,000	100,000	100	4,075,178	July 1906	1.50
George's C'k Coal	Md	2,500,000	22,000	100	1,188,000	July 1904	3.00
Home Oil	Cal	100,000	100,000	1	507,500	Oct. 1904	.02½
Ill. Crude Oil	Cal	200,000	200,000	1	12,500	Dec. 1904	.01½
Imperial Oil	Cal	1,000,000	100,000	100	880,000	July 1905	.20
International Salt		30,000,000	182,280	100	744,780	Sept 1906	1.00
Jeff. & Cl'f C. & I., com	Pa.	1,500,000	15,000	100	330,000	Aug. 1905	5.00
Jeff. & Cl'f. C. & I., pf	Pa.	1,500,000	15,000	100	788,000	Feb. 1906	2.50
Kern River Oil	Cal	2,000,000	20,000	100	39,500	May 1905	.13
Lehigh Coal & Nav.	Pa.	14,345,850	346,897	50	23,533,303	Nov. 1905	2.00
Maryland Coal, pf.	Md	2,000,000	18,850	100	1,442,560	June 1906	4.00
Monon R. Coal, pf.	Pa.	10,000,000	100,000	100	3,154,945	Jan. 1906	.97
Monte Cristo Oil	Cal	500,000	500 000	1	120,000	July 1905	.01
National Carbon, pf.	U. S	4,500,000	45,000	100	2,047,500	May 1905	1.75
National Lead, com.	N. Y	15,000,000	149,054	100	1,490,540	July 1906	1.00
National Lead, pf.	N. Y	15.000,000	149,040	100	15,280,048	June 1906	1.75
Nat'l Steel & Wire, pf.	N. Y	5,000,000	25,778	100	631,561	May 1906	1.75
New Central Coal	Md	1,000,000	50,000	20	310,000	Nov. 1905	.40
Oil City Petroleum	Cal	500,000	500,000	1	55,000	July 1905	.00½
Pacific Coast Borax	Cal	2,000,000	19,000	100	2,086,500	Aug. 1905	1.00
Peerless Oil	Cal	1,000,000	92,000	10	396,320	May 1905	.14
Penna. Salt	Pa.	3,000,000	60,000	50	13,988,000	Oct. 1905	3.00
Penna. Steel	Pa	25,000,000	168,214	100	5,849,497	Nov. 1905	3.50
Phila. Gas, com	Pa	28,953,029	579,061	50	6,684,142	Nov. 1905	.75
Phila. Gas, pf.	Pa	5,744,813	114,896	50	1,583,505	Mar. 1905	1.25
Pittsburg Coal, pf.	Pa.	32,000,000	297,010	100	11,434,962	Apr. 1905	1.75
Pocahontas Coll., pf.	W. Va.	1,500,000	15,000	100	370,000	May 1906	1.50
Republic I. & S., pfd.	Ill.	25,000,000	204,169	100	1,840,014	May 1906	3.75
Sloss-Sheffield, com.	Ala	7,500,000	75,000	100	562,750	Apr. 1906	2.50
Sloss-Sheffield, pf.	Ala	20,000,000	67,000	100	2,674,000	Jan. 1906	1.75
Somerset Coal	Pa.	4,000,000	40,000	100	80,000	Feb. 1904	2.00
Standard Oil	U. S.	100,000,000	970,000	100	303,765,000	June 1906	9.00
Tenn. C. & I., com.	Tenn	22,553,600	225,536	100	2,455,353	Aug. 1906	1.00
Tenn. C. & I., pf.	Tenn	248,000	2,480	100	370,170	Aug. 1906	2.00
Texas & Pacific Coal.	Texas	2,000,000	20,000	100	1,930,000	Mar. 1905	2.00
Thirty-three Oil	Cal	500,000	100,000	5	430,000	July 1905	.10
Union Oil	Cal	10,000,000	100,000	100	1,118,766	May 1905	.50
Union National Gas.	Pa.	9,000,000	90,000	100	1,260,000	Apr. 1905	2.00
U. S. Steel Corp., cm.	U. S	550,000,000	5,083,025	100	53,360,978	Dec. 1903	1.50
U. S. Steel Corp., pf.	U. S	360,281,100	3,603,141	100	155,928,973	May 1906	1.75
Va. Carolina Ch., cm.	U. S	38,000,000	279,844	100	3,678,829	June 1903	1.25
Va. Carolina Ch., pf.	U. S.	20,000,000	180,000	100	10,740,869	July 1906	2.00
Westmoreland Coal	Pa.	3,000,000	60,000	50	8,580,000	Oct. 1905	2.50

Canada, Mexico, Central and South America.

Name of Company and Location.		Authorized Capital.	Shares. Issued.	Par Val. $	Dividends. Total to Date.	Latest. Date.	Amt.
Amistad y Conc'rdia.	Mex	$480,000	9,600	50	$258,064	Jan. 1905	$1.71
Butters' Salvador, g.	Salv	750,000	150,000	5	600,000	Apr. 1905	.25
Cariboo McKin'y, g.	B. C	1,250,000	1,250,000	1	546,837	Feb. 1904	.04
Carmen, g. s.	Mex	27,500	1,100	25	117,437	Jan. 1905	2.37
Consolidated M & S.	B. C	5,500,000	46,988	100	234,480	Aug. 1906	2.50
Copiapo, c.	Chile	1,125,000	112,500	10	3,000,900	Oct. 1904	1.20½
Crow's Nest Pass	B. C.	3,500,000	140,000	25	1,581,148	Apr. 1906	.62½
Dominion Coal, com.	N. S	15,000,000	150,000	100	1,059,000	Dec. 1903	1.75
Dominion Coal, pf.	N. S	3,000,000	30,000	100	3,330,000	Jan. 1905	4.00
Dos Estrellas, g. s.	Mex	150,000	3,000	50	1,020,555	July 1905	13.65
El Oro, g. s.	Mex	5,750,000	1,080,000	5	2,708,800	July 1904	.15
Esperanza, s. g.	Mex	2,275,000	455,000	5	2,667,599	Jan. 1906	2.62½
Granby Con.	B. C	15,000,000	1,350,000	10	938,630	May 1906	.30
Greene Con., copper.	Mex	5,000,000	500,000	10	300,000	July 1905	.20
Greene Con., gold.	Mex	3,000,000	540,000	5	33,750	July 1906	.06½
Guanajuato	Mex	17,000,000	105,000	100	2,388,750	July 1906	1.75
Guggenheim Exp.	Mex	3,000,000	120,000	25	630,000	July 1906	.24
LeRoi No. 2, g.	B. C	5,000,000	50,000	100	600,000	Dec. 1905	3.00
Mexican Coal & Coke	Mex		240,000		240,000	July 1906	.50
Mex. Con. M. & S. Co.	Mex		240,000				
Mines Co. of Am.	Mex	2,000,000	2,000 000	1	2,195,000	July 1906	.01½
N. Y. & Hond. Ros	C. A	1,500,000	150,000	10	2,107,500	Feb. 1906	.20
Nipissing, S. Co.	Ont	12,000,000	1,200,000	5	180,000	July 1906	.15
North Star	B. C	1,500,000	1,300,000	1	351,000	Dec. 1904	1.00
N. S. St. & Coal, com.	N. S	5,000,000	49,703	100	788,600	Nov. 1904	2.00
N. S. St. & Coal, pf.	N. S	1.030,000	10,300	100	329,600	July 1906	2.00
Penoles*	Mex	250,000	2,500	100	7,763,375	June 1906	20 00
Reco, g. s. l	B. C	1,000,000	958,000	1	327,082	Apr. 1906	.02
Slocan Star	B. C	500,000	500,000	1	575,000	Dec. 1904	.05
St. Eugene Con.	B. C	3,500,000	3,202,000	1	402,120	Oct. 1905	.02
Tezuitlan Copper	Mex	1,000,000	10,000	100	.....	July 1906	2.00
Tilt Cove, c.	N. F	1,000,000	89,000	2	21,360	Jan. 1905	.48
Tyee, c.	B. C	940.000	180,000	5	136,800	Dec. 1904	.24

*Mexican Currency.

THE MINING INDEX.

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere.

We will undertake to furnish a copy of any article (if in print) in the original language, for the price quoted. Where no price is quoted the cost is unknown. These papers are not kept in stock, but must be ordered from the publisher; hence there will be some delay for foreign papers.

No accounts can be opened for these small amounts, but remittance must be sent with order. For the convenience of those making small but frequent remittances, coupons are furnished at the following prices: 20 cents each, six for $1.00, thirty-three for $5.00 and one hundred for $15.00. This arrangement will be especially appreciated by foreign readers and men in distant mining camps. Where remittances are made in even dollars we will return the excess over an order in coupons upon request.

ECONOMIC GEOLOGY.

1—BRITISH COLUMBIA—A Reconnoissance Into Tulameen, B. C. H. F. Evans. (Mg. Wld., June 16 and July 7, 1906.) Brief geological and mining notes of a new district in British Columbia. 40c.

2—CALIFORNIA—Description of the Redding Quadrangle, California. (U. S. Geol. Surv., Geologic Atlas of the U. S., Fol. No. 138, 1906.) Topographic and geological description of the above quadrangle, with topographic and areal geology maps; also structure and columnar section sheets.

3—COSTA RICA—Mineral Deposits of Costa Rica. F. C. Nicholas. (Mg. Wld., June 16, 1906). Brief description of occurrences of valuable minerals in this country. 20c.

4—DATOLITE—From Westfield, Massachusetts. E. H. Kraus and C. W. Cook. (Amer. Jl. of Sci., July, 1906; 7½ pp.) Mineralogical description of certain specimens from Westfield, Mass. 60c.

5—EARTHQUAKE—Report of the State Commission on the California Earthquake. A. C. Lawson and A. O. Leuschner. (Eng. Rec., July 21, 1906). Reprint of the report of the State Commission appointed to investigate the essential facts of the recent California earthquake. 20c.

6—FOSSILIZATION—Conditions of Fossilization. J. C. Hartzell. (Jl. of Geol., May-June, 1906; 21 pp.) Mainly a definition of fundamental terms employed in the study of paleontology. 60c.

7—FOSSILS—Cambrian Fossils from the Pioche Mountains, Nevada. F. J. Pack. (Jl. of Geol., May-June, 1906; 16 pp.) Describes and illustrates certain Cambrian fossils, mainly trilobites, from this region. 60c.

8—METEORITE—The Estacado Aërolite. K. S. Howard and J. M. Davison. (Amer. Jl. of Sci., July 1906; 5 pp.) Illustrated chemical description of this Texas aërolite. 60c.

9—NEVADA—The Tonopah Volcanoes. A. Lakes. (Mines and Minerals, July, 1906). Brief notes on the geology of Tonopah, Nev. 40c.

10—NEW YORK—The Occlusion of Igneous Rock Within Metamorphic Schists, as Illustrated on and near Manhattan Island, N. Y. A. A. Julien. (Annals, N. Y. Acad. Sci., Vol. XVI., No. 8, Part III, Mar. 1, 1906; 60 pp.) A geological and petrographical study of certain rocks occurring in the vicinity of New York.

11—PSEUDOMORPHS—Note on Two Interesting Pseudomorphs in the McGill University Mineral Collection. R. P. D. Graham. (Amer. Jl. of Sci., July, 1906; 7½ pp.) Crystallographic description of a pseudomorph of orthoclase after laumotite, and of an indeterminate mineral after corundum. 60c.

12—RUSSIA AND INDIA—The Russian Carboniferous and Permian compared with those of India and America. Chas. Schuchert. (Amer. Jl. of Sci., July, 1906; 18 pp.) Petrological and paleontological description of the strata in this district. 60c.

13—SOUTH DAKOTA—Various Minerals in the Black Hills. Jesse Simmons. (Black Hills Mg. Rev., June 22, 1906; 2½ pp.) Mentions the occurrences of various minor minerals in the Black Hills. 20c.

14—SPAIN—Ueber einige Erzlagerstätten der Provinz Almeria in Spanien. F. F. Fircks. (Zeit. f. prak. Geologie, May, 1906; 7 pp.) Describes the general geology and ore occurrences, the lead-copper deposits of Pinar de Bédar, and the iron mines of Serena and Tres Amigos.

15—STIBIOTANTALITE—S. L. Penfield and W. E. Ford. (Amer. Jl. of Sci., July, 1906; 17 pp.) Description of a new mineral from Mesa Grande, Cal. 60c.

16—WYOMING—Geology of the Owl Creek Mountains with Notes on Resources of Adjoining Regions in the Ceded Portion of the Shoshone Indian Reservation, Wyoming. N. H. Darton. (Washington, D. C., Govt. Printing Office; 48 pp.) Illustrated description of the geology and resources of southwestern Wyoming.

COPPER.

17—GLOBE DISTRICT, ARIZONA. D. E. Woodbridge. (Eng. & Mg. Jl., June 30, 1906; 3½ pp.) Describes the general geology, mineralogy and occurrence of ore. 20c.

18—BRAZIL—Ueber das Vorkommen von gediegen Kupfer in den Diabasen von Sao Paulo. E. Hussak. (Centralblatt f. Mineralogie, Geologie, June 1, 1906). Brief notes on the occurrence of native copper in diabase, in which it is found as metallic flakes. 20c.

19—BRITISH COLUMBIA—Gribbell Island: Its Geology and Mining Operations. W. M. Brewer. (B. C. Mg. Rec., June, 1906.) Notes respecting mining on this island, situated about 150 miles north of Vancouver island, where several copper deposits are being developed. 40c.

20—IDAHO—The Lost Packer Copper-Gold Lode. E. P. Jennings. (Mg. & Sci. Press, June 30, 1906.) A short account of a remarkable copper vein in Custer Co., Idaho. 20c.

21—NEVADA—The Copper Deposits of the Robinson Mining District, Nevada. A. C. Lawson. (Univ. of Cal., Bull. of Dept. of Geol., Vol. 4, No. 14; pp. 287-357; 70 pp.) A highly important monograph treating exhaustively of the economic geology of this important district. 60c.

22—PYRITES DEPOSITS of Huelva, Spain. R. E. Carr. (Eng. & Mg. Jl., June 23, 1906.) Brief note as to the occurrences of pyrites at Rio Tinto and method of mining. 20c.

FUELS.

23—COAL MEASURES — Carboniferous Coal Measures in the Southwest. Chas. R. Keyes. (Eng. & Mg. Jl., June 16, 1906.) Geology of an interesting coal formation in central New Mexico. 20c.

24—FOSSILS — Observations Paléontologiques sur le Mode de Formation du Terrain houiller Belge. A. Renier. (Annales de la Soc. Geol. de Belgique, Apr. 19, 1906; 54 pp.) Notes on the fossils in the Belgian coal fields, and their bearing upon the theory of the formation of these coal deposits.

25—GENESIS OF COAL—Theory of the Formation and Occurrence of Coal Fields. J. Ford. (Paper read before the Nat. Assn. of Coll. Managers, June 30, 1906.) The theories of coal formation as here advanced are somewhat at variance with the ideas generally held. The author, however, ably sustains his argument by a lengthy and technical discussion. The results of observations with the microscope are given. 20c.

26—NEBRASKA—A Workable Bed of Coal in Nebraska. E. H. Barbour. (Science, July 13, 1906.) Description of a bed of coal 34 in. in thickness, recently exposed near Peru, Neb., this being the first discovery of a workable coal seam in that State. 20c.

27—PETROLEUM—The Oil Fields of Trinidad. E. H. C. Craig. (Mg. Jl., July 7 and 14, 1906.) Geological conditions of a new oil field which has not yet been thoroughly explored. 40c.

28—RUMANIAN OIL FIELDS—Notes on the Rumanian Oil Fields. P. C. A. Stewart. (Bi-monthly Bull., Amer. Inst. Mg. Engrs., July, 1906; 5 pp.) Brief notes on the occurrence of petroleum, methods of drilling, statistics of production, etc.

29—RUSSIAN COALS—Die fossilen Kohlen und Kohlenstoffverbindungen des fernen Ostens Russlands vom Gesichtspunkte deren chemischer Bestandteile. A. M. Ossendowsky. (Oest. Zeit. f. Berg- u. Hüttenw., June 23, 30 and July 7, 1906; 26 pp.) Treats of the chemical composition of certain Russian coals. $1.20.

GOLD AND SILVER.

30—CANADA—The Daigle Mine. W. A. Laycock. (Can. Mg. Rev., July, 1906; 6 pp.) Description of interesting ore occurrences in southeast corner of Coleman township, Ont. 40c.

31—NEW SOUTH WALES—Geology of the Peaks Silver Field, with Special Reference to the Ore Deposits. C. O. G. Larcombe. (Proc., Australasian Inst. Mg. Engrs., Nov., 1905; 29 pp. and 8 pls.) Description and discussion of the ore deposits of the Peaks silver field, situated at the head of Burragorang valley, New South Wales.

32—ONTARIO—A Comparison of the Cobalt and Sudbury Mining Districts. H. W. Hixon. (Can. Mg. Rev., July, 1906.) Discussion of the theories of ore formation in these districts, especially combatting the magmatic segregation theory as to the formation of the Sudbury ore deposits, the opinion being expressed that all these veins were due to highly heated solutions coming from great depth through small fractures along planes of movement in process of folding. 40c.

33—ONTARIO—The Cobalt Mining District. W. M. Courtis. (Eng. & Mg. Jl., July 7, 1906.) Treats of the geology and mining conditions. 20c.

34—WESTERN AUSTRALIA—Mines of the Randell's District. A. Montgomery. (W. A. Mg., Bldg. & Eng. Jl., May 19, 1906.) Brief notes on the geology of a gold mining district 33 miles southeast of Bulong. 20c.

IRON.

35—BELGIUM—Les gisements ferromanganésifères de la Lienne. Jos. Libert. Annales de la Soc. Geol. de Belgique, April 19, 1906; 10 pp.) Geological study of the deposits of manganiferous iron ore at Lienne, Belgium, which furnishes an ore containing 17 to 21 per cent. manganese and 15 to 21 per cent. iron.

LEAD AND ZINC.

36—AUSTRIA—Ueber die triadischen Zink- und Bleierzlagerstätten im Grossherzogtum Krakau. (Oest. Zeit. f. Berg- und Hüttenw., June 2, 1906.) History and economic geology of the lead and zinc ore deposits of Duchy of Krakau, Galicia, Austria. 40c.

37—WISCONSIN Lead and Zinc District. (Eng. & Mg. Jl., June 23, 1906; 3 pp.) History, geology and mineralogy of the district. 20c.

LESSER MINERALS.

38—DIAMOND—Betrachtungen über das Diamantproblem. A. Koenig. (Zeit. f. Elektrochemie, June 29, 1906; 3½ pp.) A comparison of the physical properties of the several forms in which carbon appears. 40c.

39—MAGNETIC PYRITES—Die Kristallform des Magnetkies. E. Kaiser. (Centralblatt f. Mineralogie, Geologie, etc., May 1, 1906; 4 pp.) Notes on the crystallography of magnetic pyrites with reference to the magnetic property of that mineral. 40c.

40—PLATINUM Deposits of British Columbia. H. F. Evans. (Mg. Wld., July 14, 1906.) Describes occurrence of platinum on the Tulameen, Similkameen and other creeks of British Columbia. 20c.

41—PYRITES—Der Kiesbergbau Louisenthal (Fundul Moldavi) in der Bukowina. K. A. Redlich. (Oest. Zeit. f. Berg- u. Hüttenw., June 9, 1906; 2½ pp.) Geology of a deposit of pyrites in the south of the Bukowina, Austria. 40c.

42—RARE EARTHS—Das Vorkommen der seltenen Erden. C. R. Böhm. (Chemische Industrie, July 1, 1906; 11½ pp.) An exhaustive study of the nature and occurrence of the minerals in which the rare elements are found.

43—TIN in Cape Colony. S. S. Keyzer. (Mg. Jl., July 7, 1906.) Outlines the prospect of the tin-producing district between Kuils river and Stellenbosch. 20c.

MINING.

44—CANANEA—The Riots at Cananea. (Eng. & Mg. Jl., June 16, 1906.) An account of the recent labor troubles. 20c.

45—BRAZIL and Its Mineral Industry. A. Brandenburg. (Mg. Mag., July, 1906; 6½ pp.) Summary of the mineral industry of Brazil, especially with respect to gold and diamond mining. 20c.

46—BRITISH COLUMBIA—Mining in British Columbia. (Can. Mg. Rev., July, 1906; 2½ pp.) Summary of the statistics of production by districts in 1904 and 1905. 40c.

47—BRITISH COLUMBIA—Preliminary Report on the Rossland Mining District. R. W. Brock. (B. C. Mg. Rec., June, 1906; 20½ pp.) Preliminary data as to the recent investigation conducted by the Canadian Geological Survey, summarizing mining conditions, occurrence of the ore deposits and methods of mining and concentration. 40c.

48—BRITISH COLUMBIA — Rossland Mining. A. W. Dyer. (Can. Mg. Rev., July, 1906.) Summary of the recent progress in mining in this important district, with outline of probable future developments. 40c.

49—BRITISH COLUMBIA — Southeast Kootenay District. (B. C. Mg. Rec., May, 1906.) Notes from the report of the gold commissioner of Fort Steele Mining Division for 1905. 40c.

50—CANADA—Engineering Development in Canada from 1896 to 1906. R. J. Durley. (Eng. Rev., Lond., July, 1906; 12½ pp.) Review of engineering development in Canada, especially of railway development, special reference being made to the newly projected railways, articles regarding which have appeared from time to time. 40c.

51—CORNWALL AND DEVON—Mines in Cornwall and Devon that Should be Reopened. J. H. Collins. (Mg. Wld., Lond., July 7, 1906.) List of old mines which, in the opinion of the author, deserve to be reopened and vigorously worked. 20c.

52—DRILLING—The Science of Economically Mining Hard Ground with Percussive Rock Drills and Compressed Air. W. A. T. Davies. (Proc., Australasian Inst. of Mg. Engrs., Apr., 1906; 13 pp.) Discussion of the use of the machine drill in mining.

53—EARTH MOVEMENT—Ueber einige Terrainverschiebungen am Hüttenberger Erzberg. B. Granigg. (Oest. Zeit. f. Berg- u. Hüttenw., July 7, 1906.) Account of an earth movement of the Hüttenberg mine. 40c.

54—FRANCE—Mining and Metallurgy in France. M. Vingoe. (Eng. & Mg. Jl., July 14, 1906.) Notes on current conditions. 20c.

55—GERMANY—The Trade and Commerce of Germany in 1905. F. Oppenheimer. (Iron & Coal Tr. Rev., July 6, 1906.) Discussion of industrial conditions illustrated by statistics, with especial reference to the coal trade. 20c.

56—HEAD FRAME—The Leonard Head Frame. A. H. Halloran. (Mg. & Sci. Press, June 30, 1906.) Brief data respecting the recently erected steel head frame at the Leonard shaft of the Boston and Mont. Co., Butte, Mont. Illustrated. 20c.

57—METALS IN ENGLAND—Notes on Some of the Less Common Metals in the West of England. J. H. Collins. (Eng. & Mg. Jl., June 30, 1906.) Historical, mineralogical and technical data of tin, copper, antimony, bismuth, nickel, tungsten, uranium and other rare minerals in Cornwall. 20c.

58—MEXICO—Three Weeks in Mexico. T. A. Rickard. (Mg. & Sci. Press, July 7, 1906; 3 pp.) Account of a journey from New York to Mexico, referring to the mines in Cuba. 20c.

59—MINE RAILROAD—The Lake Champlain and Moriah Railroad. J. H. Granberry. (Eng. & Mg. Jl., June 30, 1906.) Description of the construction and equipment of an important mine railroad in New York State. 20c.

60—MINE REPORTS—Accuracy vs. Enthusiasm and Prejudice in Mine Reports. P. Williams. (Eng. & Mg. Jl., June 16, 1906.) Gives advice respecting methods in mine examination. 20c.

61—MINE SKETCHING — A. Lakes. (Mines & Min., July, 1906.) Suggestions as to methods of making perspective drawings of various kinds of timbering and other underground details of mines. 40c.

62—MINE SURVEYING—Das Gruben-Nivellierinstrument von Cseti und seine Modifikation nach Prof. Dolezal. E. Dolezal. (Oest. Zeit. f. Berg- u. Hüttenw., June 2, 1906; 3 pp.) Continuation of serial, describing the method of operating the Cseti mine surveying apparatus. 40c.

63—MINE SURVEYING—The Qualifications of a Mine Surveyor. H. Briggs. (Coll. Guard., July 6, 1906.) Refers to various methods of underground surveying and their execution. 20c.

64—MINING CLAIMS—The Patenting of Mineral Land. H. J. Jory. (Mg. Rep., July 5, 1906; 2 pp.) Description of the proper procedure and approximate expense in patenting mineral land. 20c.

65—MINING METHODS for the Excavation of the Culebra Cut. H. M. Chance. (Eng. Mag., July, 1906; 9 pp.) This is of interest as showing the application of the methods used in mining on a large scale to work which would ordinarily be supposed to come directly in the province of the civil engineer. It calls special attention to mining, as carried on in the Mesabi range of Minnesota. 40c.

66—MINING SYSTEM—The "Slash" System of Mining. Claude T. Rice. (Eng. & Mg. Jl., June 23, 1906.) A modification of the square set and caving systems employed in the Bingham district, Utah. 20c.

67—MUTUAL AID SOCIETIES—Les Sociétés de Secours Mutuels de Mineurs en 1903 et 1904. E. Boulanger. (Bull. de l'Office du Travail, June, 1906.) Statistics of the miners' mutual aid societies of France for 1903 and 1904. 20c.

68—NEW SOUTH WALES—The progress and Present Position of Engineering in New South Wales. J. W. Roberts. (Eng. Rev., July, 1906; 12 pp.) Review of the engineering development of New South Wales, with special reference to iron and gold mining and reduction, and the industries connected therewith. 40c.

69—NEW ZEALAND—Engineering in New Zealand. H. A. McGregor. (Eng. Rev., Lond., July, 1906; 6½ pp.) Description of the railway and harbor works, and mining properties in this province. 40c.

70—PERU—The Mining Industry in Peru. M. C. Gonzales. (Mg. Mag., July, 1906; 10½ pp.) A valuable summary of the history of mining and occurrence of metals in Peru. 20c.

71—PROFESSIONAL ETHICS—R. W. Raymond. (Eng. & Mg. Jl., June 23, 1906; 2½ pp.) Address of the author to the graduating class at Lehigh University, June 1, 1906. 20c.

72—PROSPECTING—A Few Hints to Prospectors. C. A. Bramble. (Can. Mg. Rev., June, 1906.) Suggestions as to the equipment for prospecting up to and beyond the Height of Land, Canada. 40c.

73—PUMPING and Mine Ventilation. Dennis H. Stovall. (Mg. Wld., July 14, 1906.) Describes installation of an electrically operated centrifugal pump. 20c.

74—QUEENSLAND — Engineering in Queensland. Thos. Parker. (Eng. Rev., July, 1906; 10 pp.) Review of engineering development in Queensland, giving details of railway, bridge and harbor work, artesian wells and mining, with especial reference to the Mount Morgan gold mine. General steam machinery, windmills and electric tramways are also described. 40c.

75—RHODESIA Chamber of Mines. Report of the Executive Committee for the Twelve Months Ended 31st March, 1906. (Pub. by Argus Co., Bulawayo, 1906; 16 pp.)

76—RUSSIAN MINERAL PRODUCTION. (Eng. & Mg. Jl., June 23, 1906.) Statistics for 1905, together with references to new industrial developments. 20c.

77—SAFETY MEASURES in Mining. D. Macauley and L. G. Irvine. (Jl. Chem., Met. & Mg. Soc'y of So. Afr., Apr., 1906; 16 pp.) Refers especially to the necessity for, and means for securing, adequate ventilation in mines. 60c.

78—SWEDEN—Gellivare Malmberg. Axel Dellwik. (Jern-Kontorets Annaler, 1906; Tredje häftet; 50 pp. with 10 plates.) An elaborate article on the geological features of the district, and methods of mining employed, illustrated by many half-tones and drawings, and accompanied by map. 80c.

79—TESTING WORKS—W. H. Kinnon. (Ores & Metals, July 1, 1906.) Mentions certain precautions to be observed in estimating the value of a mine. 20c.

80—TRANSVAAL Mines Department. Half-Yearly Report of the Government Mining Engineer for the Six Months Ending 31st December, 1905. (Govt. Printing & Stat. Office, Pretoria, 1906.) Statistical data regarding labor and wages, mineral output, accidents and prosecutions, explosives and stores, and capital, for the above period.

81—TRANSVAAL — Statistics of the Mines Dept., Transvaal, for the months of April and May, 1906. (Gov't Mg. Engrs.' Office, Johannesburg; 20 pp.) Gives statistics of production and other details of mining.

82—WESTERN AUSTRALIA—Engineering Progress in Western Australia. Wm. Leslie. (Eng. Rev., Lond., July, 1906; 8½ pp.) Gives details of the design and construction of the water supply in the city of Perth, also gives notes on the mining development, and the construction of railways. 40c.

APPARATUS.

83—ACETYLENE LAMPS—Acetylengruben lampen für schlagwetterfrele und Schlagwettergruben. (Oest. Zeit. f. Berg- und Hüttenw., June 2, 1906; 4 pp.) Illustrated description of acetylene lamps, both safety lamps and open lamps, employed in Europe, with data of cost, etc. 40c.

84—ACETYLENE LAMPS for Miners. F. W. Parsons. (Eng. & Mg. Jl., July 21, 1906.) Illustrated description of the Baldwin acetylene mining lamp, which is a new, cheap and convenient form of this type of lamp. 20c.

85—ELECTRIC POWER PLANT at the Tarbrax Oil Co., Ltd. J. Caldwell. (Coll. Guard., June 15, 1906.) The dimensions entering into the construction of the plant and installation of the machinery are given. Two illustrations are attached showing the approved pumps that are here used. 20c.

86—HAULAGE—Recent Developments in Electric Mine Haulage. (Eng. & Mg. Jl., June 30, 1906.) Describes design of small mining locomotives in recent practice. 20c.

87—HOISTING—Overwinding in Hoisting. (Eng. & Mg. Jl., June 16, 1906.) Discussion of Prof. Peele's paper recently noted. Suggests means for preventing overwinding in connection with bucket hoisting. 20c.

88—LOADING DEVICES—Some Dumping Dodges. W. T. Heslop. (Mines & Min., July, 1906.) A description of some devices employed in South Africa for loading and unloading material, especially in connection with the DeBeers diamond mines and certain coal mines. 40c.

89—MACHINE DRILLS — Large vs. Small Machine Drills. E. W. Ralph. (Mg. & Sci. Press, July 7, 1906.) Discussion of machine drilling as an element in the cost of mining. 20c.

90—MINE SWITCH—An Automatic Mine Switch. (Mines & Min., July, 1906.) Description of switch to enable cars to pass each other on a single track as installed at a colliery near Scranton. 40c.

91—PUMP DRIVE. (Eng. & Mg. Jl., June 23, 1906.) Description of an ingenious device for providing a liberal supply of oil to a special machine. 20c.

92—WIRE ROPES—The Strength of Brazed Joints in Steel Wires. H. Louis. (Paper read before the June 14, 1906, meeting of the Instn. of Mg. Engrs.) Gives data as to the strength of steel wires with brazed joints used for making long hoisting ropes. 20c.

COPPER.

93—COPPER QUEEN — ARIZONA. D. E. Woodbridge. (Eng. & Mg. Jl., June 16, 1906.) History, Geology and mining methods employed at Bisbee, Ariz. 20c.

94—CALUMET AND ARIZONA GROUP. D. E. Woodbridge. (Eng. & Mg. Jl., June 23, 1906; 2 pp.) History, geology and mining methods of an important group of mines. 20c.

95—OLD DOMINION MINE, Arizona.

D. E. Woodbridge. (Eng. & Mg. Jl., July 7, 1906; 2½ pp.) A detailed account of the geology of the Old Dominion mine, and the mining and smelting methods employed. 20c.

96—AUSTRALIA—Copper Mining in Australia. F. S. Mance. (Eng. & Mg. Jl., July 21, 1906.) Brief notes on the present status of the industry, with especial reference to the Wallaroo and Moonta, Great Cobar and Mount Morgan mines. 20c.

97—BRITISH COLUMBIA—The British Columbia Copper Co. and the B. C. Mine. E. Jacobs. (B. C. Mg. Rec., June, 1906; 2½ pp.) Notes on the history, present operations and future prospects. 40c.

98—CLIFTON - MORENCI DISTRICT, Arizona. D. E. Woodbridge. (Eng. & Mg. Jl., July 14, 1906; 2½ pp.) Describes the mining and milling methods in this important copper district. 20c.

99—CLIFTON - MORENCI - METCALF DISTRICT, Arizona. Dwight E. Woodbridge. (Eng. & Mg. Jl., July 21, 1906; 3 pp.) Description of the Shannon, Detroit and Arizona Copper Companies' mines, mills and smelters, near Clifton, Ariz. 20c.

100—JAPAN—Copper Mining in Japan. (Eng. & Mg. Jl., July 21, 1906.) Notes upon the development of the Kosaka mine, which has now acquired the premier position in Japan. 20c.

101—NEVADA—Ely, Nevada. A. H. Halloran. (Mg. & Sci. Press, July 7, 1906; 2½ pp.) Geology and mining methods at the property of the Nevada Consolidated Copper Co. 20c.

102—NEVADA—Ely, Nevada's Great Copper Camp. (Salt Lake Mg. Rev., July 15, 1906; 4½ pp.) General notes on mining conditions at this camp. 20c.

103—TASMANIA—Mount Lyell Copper Mine. S. A. Ionides. (Mg. & Sci. Press, June 30, 1906.) Brief notes relating to the mining and metallurgical practice at Mt. Lyell. 20c.

FUELS.

104—ACCIDENTS—Refuge Holes on Haulage Roads. (Eng. & Mg. Jl., July 21, 1906.) Argument that means should be provided to avoid accidents from runaway cars in mine roadways. 20c.

105—AIR COMPRESSORS — Electrically Driven Air Compressors Combined with the Working of the Ingersoll-Sergeant Heading Machines and the Subsequent Working of the Busty Seam at Ouston Colliery. A. Thompson. (Paper read before the June 14, 1906, meeting, Instn. Mg. Engrs.) Discusses methods of mining, with many detailed figures of costs. 20c.

106—ALABAMA COAL MINING—Methods of Mining, Hauling and Screening at the Mines of the Aldrich Mining Company, at Brilliant, Alabama. T. H. Aldrich. (Bimonthly Bull., Amer. Inst. Mg. Engrs., July, 1906; 19½ pp.) Comprehensive description of the mining methods at two important collieries in Alabama, giving many illustrations of apparatus employed and figures as to cost of mining, etc.

107 — ANTHRACITE — History of the Preparation of Anthracite. J. Maguire. (Mines & Min., July, 1906.) Historical notes on mining in the anthracite coal field of Pennsylvania. 40c.

108—BOBBINITE in Coal Mines. (Iron & Coal Tr. Rev., June 8, 1906.) Continuation of evidence before the Home Office Committee of Great Britain, discussing the strength and safety of this explosive. 20c.

109—BOILERS—Feed Water of Colliery Boilers. A. E. Cooke. (Paper read before the No. Staffordshire Inst. of Mg. & Mechan. Engrs., July 9, 1906.) Discusses the advantages accruing from softening the feed water of colliery boilers. 20c.

110—BRITISH COAL—Coal Mines Inspection Reports for 1905. Liverpool and North Wales District. (Coll. Guard., June 29, 1906.) Deals with the men employed above and below ground, giving statistics which show the production of coal per man, number of compressed air and electrical machines in use, and summary of accidents, classified according to place and cause. 20c.

111—BRITISH COAL—Reports of Mines Inspectors for 1905. Cardiff District. (Iron & Coal Tr. Rev., June 8, 1906.) Give statistics of accidents, mineral production and use of coal cutting machines in the above district. 20c.

112—BRITISH COAL—Reports of Mines Inspectors for 1905. Manchester and Ireland District. (Iron & Coal Tr. Rev., June 29, 1906.) A summary of the year's work, giving statistics regarding the number of persons employed, output of mineral, kind and number of coal cutting machines, accidents and use of explosives. 20c.

113—BRITISH COLUMBIA — Progress made by the West Canadian Collieries, Ltd. (B. C. Mg. Rec., May, 1906; 3½ pp.) History and geology of certain collieries north of Frank, Alberta, with some account of the methods of mining and description of battery of Bernard-Belgian coke ovens. 40c.

114—COAL CUTTING MACHINES—Practical Problems of Machine Mining. S. Mavor. (Paper before the June 14, 1906, meeting of the Instn. of Mg. Engrs.; 60 pp.) A long paper discussing the advantages of coal cutting machines and the proper methods for their operation.

115—COAL MINING by Open Stripping in Pennsylvania. F. W. Parsons. (Eng. & Mg. Jl., June 30, 1906; 2 pp.) A detailed description of open-cast mining in the Hazelton district, Pa., with full data as to costs, etc. 20c.

116—COAL MINING—Consolidation Coal Co., Buxton, Ia. Rack Rail Haulage in Four Mines. (Elec. Mg., June, 1906; 11 pp.) Illustrated description of the equipment of the mines of above company, and methods of mining. 20c.

117—COAL MINING LAWS—Should the Bituminous Laws be Revised and How? J. B. Douthitt. (Coal, July 5, 1906; 2 pp.) Discussion of the various State mine laws, and suggestions as to their necessary revision. 20c.

118—COAL MINING MACHINERY—Labor-Saving Machinery in Coal Mining. F. W. Parsons. (Eng. & Mg. Jl., June 16, 1906.) Discusses how mechanical devices may replace manual labor in coal mining, with detailed estimates of costs of certain installations. 20c.

119—COAL MINING RULES in Alabama. (Eng. & Mg. Jl., June 16, 1906.) New rules to be enforced in connection with coal mining in this State. 20c.

120—COAL STORAGE—Ransom Coal Storage Plant. (Mines & Min., July, 1906; 2½ pp.) Description of a new plant for the storage of 500,000 tons of coal, and reloading it without hand labor. 40c.

121—COAL WASHING—Ingenieur Henry's Aufbereitungsversuche mit Kohlen und sein System des hydraulischen Antriebes von Aufbereitungsapparaten. Julius Divis. (Oest. Zeit. f. Berg- u. Hüttenw., June 16 and 23, 1906; 8½ pp.) Describes and illustrates a new system of coal washing employed in Belgium. 80c.

122—COAL WASHING — Recovery of Water from Coal Washers. E. Ramsay. (Eng. & Mg. Jl., June 16, 1906.) Describes apparatus for dewatering coal washer sludge. 20c.

123—COLLIERY EXHIBITION at the Royal Agricultural Hall, London N. (Iron & Coal Tr. Rev., June 15, 1906; 17 pp.) Illustrated description of the exhibits of colliery machinery and accessories. 40c.

124—DEEP MINING—Considerations on Deep Mining. G. Farmer. (Iron & Coal Tr. Rev., June 15, 1906.) Discusses the high temperature and increased cost to be met with in deep mining, together with the best method of mining to employ, and the use of coal cutting machines for thin seams. 20c.

125—ELECTRIC COAL MINING MACHINERY—Einige Gesichtspunkte für die Errichtung elektrischer Anlagen auf grösseren Steinkohlenbergwerken. (Glückauf, June 30, 1906; 7 pp.) A number of considerations on the installation of electric plants in coal mines. 60c.

126—ELECTRIC MINING LOCOMOTIVES in Great Britain. J. F. Gairns. (Eng. & Mg. Jl., July 7, 1906; 2½ pp.) Illustrated description of the various types of electric mining locomotives employed in Great Britain. 20c.

127—ELECTRIC WINDING—Commercial Possibilities of Electric Winding for Main Shafts and Auxiliary Work. W. C. Mountain. (Paper before the June 14 meeting, Instn. of Mg. Engrs.) A valuable paper describing the equipment of hoisting plants and cost of operation at large collieries in Great Britain. 40c.

128—FIRE DAMP—Notes on an Ignition of Fire Damp. T. Cook. (Paper before the Nat. Assn. of Coll. Managers, June 30, 1906.) Attempts to throw light on the dangers arising from shot firing in gassy mines, and describes an actual occurrence. Illustrated. 20c.

129—GIRARD ESTATE COLLIERIES (Eng. & Mg. Jl., July 21, 1906.) Summary of last annual report of the chief engineer of these collieries. 20c.

130—GREAT BRITAIN—The Coal Resources of the United Kingdom. J. L. Pultz. (Eng. & Mg. Jl., July 7, 1906.) Discussion of the probable life of the coal resources of Great Britain and the problems involved in deep mining. 20c.

131—HAULAGE—Notes on Top and Bottom Endless Rope Haulage on Curves at Bedlington Collieries. E. Graham. (Iron & Coal Tr. Rev., June 8, 1906.) Describes installations at two of the collieries of the Bedlington Coal Co. 20c.

132—HAULAGE — Special Arrangements for Bankhead of Self-Acting Inclines. H. Leighton. (Iron & Coal Tr. Rev., July 13, 1906.) Deals with the subject from the standpoint of economy and efficiency, and describes methods whereby little extra width of road is required. Illustrated by two figures. 20c.

133 — HYDRAULIC MINING CARTRIDGE. (Eng. & Mg. Jl., July 14, 1906.) Description of new method for breaking down coal without the use of an explosive. 20c.

134—LIFE SAVING—Unterirdische Rettungs- bezw. Fluchtstationen bei den Gruben der k. k. priv. Kaiser Ferdinands-Nordbahn in Mährisch-Ostrau. F. Pospisil. (Oest. Zeit. f. Berg- u. Hüttenw., June 9, 1906; 3½ pp.) Illustrated description of underground rescue stations in a colliery in Austria. 40c.

135—LIFE SAVING APPARATUS—The "Pneumatogen" Rescue Apparatus for Mines. R. Cremer. (Iron & Coal Tr. Rev., July 6, 1906.) Description of a new form of rescue apparatus which differs considerably from all previous ones, being a breathing apparatus in which the necessary oxygen is automatically generated, the carbon dioxide and vapor exhaled from the lungs being absorbed at the same time. 20c.

136—LIFE SAVING APPARATUS—The Shamrock Rescue Apparatus at the Courrières Colliery. G. A. Meyer. (Mg. Jl., June 23, 30, July 7 and 14, 1906.) Illustrated description of the rescue apparatus employed at the recent Courrières colliery disaster. 80c.

137—MECHANICAL ENGINEERING of Collieries. T. C. Futers. (Coll. Guard., June 8, 15, 22, 29 and July 6, 1906.) Continuation of serial, dealing in these instalments with heapsteads, screening and washing plants. Illustrated. $1.00.

138—MINE EXPLOSION—The Courrières Colliery Disaster. M. Vingoe. (Eng. & Mg. Jl., June 23, 1906.) Discussion of the causes of the Courrières disaster. 20c.

139—MINE EXPLOSIONS—Das Grubenunglück von Courrières. F. Schreyer. (Oest. Zeit. f. Berg- u. Hüttenw., June 30, 1906; 3 pp.) Account of the recent disaster at Courrières colliery, together with comments on the rescue work. 40c.

140—MINE SURVEYING—Checking Underground Surveys. W. E. Share. (Iron & Coal Tr. Rev., July 13, 1906.) Deals with the instruments employed and describes methods, as well as instructions how to plot the surveys. One sketch and a number of tables are given. 20c.

141—MINE VENTILATION—Electrically-Operated Ventilating Plant in Northberg Pit, Germany. (Eng. & Mg. Jl., July 14, 1906; 2 pp) Illustrated description of an electric ventilating plant recently installed at Eschweiler-Aue, embodying some remarkable arrangements to utilize the advantages of alternating currents. 20c.

142—MINE VENTILATION — Grubenbrandgewältigung bei unzulässiger Ventilation in gasreichen Kohlengruben, System Mayer. J. Mayer. (Oest. Zeit. f. Berg- u. Hüttenw., July 7, 1906.) Description of the Mayer system of ventilation for gassy collieries. 20c.

143—MINE VENTILATION—Some Examples of Modern Mine Ventilation. (Iron & Coal Tr. Rev., June 8, 1906.) Describes various methods now employed in the northern counties of England, with data respecting the ventilating plants installed in some of the collieries of those districts. 20c.

144—MINE VENTILATION — Underground Fans as a Method of Ventilation. F. W. Parsons. (Eng. & Mg. Jl., July 7, 1906.) Brief discussion of the subject. 20c.

145—MINE WAGES—The Rate Paid for Mining Hard Coal. (Coal Tr. Jl., July 18, 1906.) Interesting article reviewing the wages paid miners in the Schuylkill region of Pennsylvania from 1869 up to the present time. 40c.

146—PENNSYLVANIA—Value of Anthracite Lands. (Eng. & Mg. Jl., July 21, 1906.) Brief summary of the increase in value of these lands during the last 100 years. 20c.

147—PETROLEUMS of North America. A Comparison of the Character of Those of the Older and Newer Fields. C. Richardson. (Jl. Frank. Inst., July, 1906; 14 pp.) Brief review of the petroleum industry in North America, together with note, chiefly from the chemical standpoint, on the character of the various oils. Gives many valuable analyses. To be concluded. 60c.

148—PHILIPPINE COAL DEPOSITS. H. L. Wigmore. (Mines & Min., July, 1906; 7½ pp.) Illustrated description of the coal deposits of Batan Island, with account of diamond drill explorations. 40c.

149—SPONTANEOUS COMBUSTION—The Spontaneous Ignition of Coal. V. B.

Lewes. (Eng. & Mg. Jl., July 14, 1906.) Treats of the spontaneous combustion of inflammable material when stored in large bulk, and means for its prevention. 20c.

150—SUBMARINE MINING—Under-Sea Workings. John Shanks. (Paper before the No. of England Inst. Mg. & Mechan. Engrs., June 9, 1906.) The actual workings of certain collieries are described. Modern methods which have replaced the old ideas formerly in use are spoken of in detail. The article also deals with careful methods of surveying these workings. 20c.

GOLD AND SILVER.

151—AUSTRALIA — Victorian Mining Areas. E. J. Dunn. (Aus. Mg. Stand., May 23, 1906.) Description of the geology and mining methods at Ruthergien, Victoria. 40c.

152—BRITISH COLUMBIA — Cariboo District. (B. C. Mg. Rec., May, 1906; 11 pp.) Notes from the report of the gold commissioner for 1905. 40c.

153—BRITISH COLUMBIA—Mining in Northern British Columbia. (Can. Mg. Rev., July, 1906; 5 pp.) Abstract of last report of the Berry Creek Mining Co., giving much valuable data respecting mining conditions in the Cassiar mining division. 40c.

154 — BRITISH COLUMBIA — Osoyoos Mining Division. C. A. R. Lambly. (B. C. Mg. Rec., May, 1906; 2½ pp.) Reprint of report of gold commissioner of this mining division, which embraces the southern part of the Okanagan country and the southeastern portion of the Similkameen district. 40c.

155—BRITISH COLUMBIA—The Eva Mine, A. W. Dyer. (Can. Mg. Rev., July, 1906.) History, developments of mining methods at the Eva mine in the Lardeau district, together with valuable figures respecting the cost of mining. 40c.

156 — CALIFORNIA — Gold Mining in Siskiyou Co., Cal. C. G. Gunther. (Mines & Min., July, 1906.) Account of modern methods employed in old placer fields already worked over by early prospectors, with notes on lode mining and methods of milling. 40c.

157—COLORADO—The Grayback Mountain Mining District. E. A. Ritter. (Ores & Metals, July 15, 1906.) Brief description of the mines of the Grayback mining district, situated on the eastern slope of the Sangre de Cristo range, Colo., at its southernmost extremity. 20c.

158—GOLD DREDGING in the Urals, with Notes on Dredging in Siberia. W. H. Shockley. (Bi-Monthly Bull., Amer. Inst. Mg. Engrs., July 1906; 9 pp.) Notes as to the occurrence of placer gold, together with methods of mining employed, and the condition under which the industry is carried on.

159—GOLD INDUSTRY—L'or dans le Monde et son Extraction écoonmie et Répartition de la Production Aurifère. L. de Launay. Revue générale des Sciences, June 15 and 30, 1906; 27 pp.) An elaborate statistical, industrial, geological and metallurgical study of the production of gold in the world, by an eminent authority. 80c.

160—HONDURAS—F. J. Nagel. (Mg. Mag., July 1906; 2½ pp.) Refers especially to mining and milling at the Rosario mine. 20c.

161—KALGOORLIE Revisited. D. Clark. (Aus. Mg. Stand., June 6, 1906.) Discusses recent developments in mining and metallurgy in Kalgoorlie. 20c.

162—MEXICO—The Palmarejo and Mexican Goldfields Company. (Eng. Mg. Jl., June 16, 1906.) Gives data as to cost of mining, milling, etc. 20c.

163—MEXICO—The Placer Gold of Altar, Sonora. (L. A. Mg. Rev., July 7, 1906.) History, occurrences and methods of mining of the placers in the Magdalena and Altar districts. 20c.

164—MEXICO—The Taviche District, Mexico. K. Thomas. (Mg. Wld., June 16, 1906.) General review of mining and metallurgical conditions in the district. 20c.

165—NEVADA—The Discovery of Tonopah. (Eng. & Mg. Jl., July 14, 1906). An accurate statement of the discovery of Tonopah, based upon information obtained from the discoverers. 20c.

166—NEVADA—Tonopah, Nevada. Claude T. Rice. (Eng. & Mg. Jl., July 21, 1906; 2½ pp.) Account of present mining methods in this district, with notes on the geology and industrial conditions, including rates of wages, treatment charges on ore, etc. 20c.

167—NICARAGUA—The Murra District, Nicaragua. C. W. Benton. (Mg. Wld., July 7, 1906.) Illustrated description of the above gold mining district in the Dept. of Segoria. 20c.

168—PERU—Minas de Oro en el Peru. C. R. Enock. (Bol. de la Soc. Nac. de Mineria, Feb. 28, 1906; 6 pp.) Describes the occurrence of gold mines in Peru, together with notes on the general mining conditions.

169—PLACER MINING—Hydraulic Suction Elevator. D. B. Waters. (Proc., Australasian Inst. Mg. Engrs., Nov., 1905; 7 pp.) Description of elevator for working certain classes of alluvial deposits.

170—PLACER MINING—Mergers in Placer Mining. J. P. Hutchins. (Eng. & Mg. Jl., June 23, 1906; 4½ pp.) Discussion of economies effected by consolidation in the operation of placer mines. 20c.

171—PROSPECTING a Gold Placer. (Mines & Min., July, 1906; 3½ pp.) Description of a method of prospecting gold placers by means of a churn drill, together with rules for computing the results. 40c.

172—RAND—A New Asset for the Rand. (So. Afr. Mines, June 16, 1906.) Describes the exploratory work now being carried out on the quartzsitic and pyritic band underlying the main reef, which has been found in at least a dozen mines, with good prospects of locating it in many more. It is considered probable that several mines will be able to stope considerable ore from this body. 20c.

173—RAND Mining Results in 1905. (So. Afr. Mines, May 19, 1906.) Tabulated data of operations on the Rand during 1905. 20c.

174—RAND — The Native Labor Question. (So. Afr. Mines, June 16, 1906.) Reprint of an anonymous pamphlet dealing with the question of unskilled labor for the mines, the purpose being to show that if the Chinese now employed on the Rand are repatriated, there is no fair probability of replacing them with South African natives. 20c.

175—RAND MINES—Last Year's Purchases of Machinery by the Rand Mines, Ltd. (So. Afr. Mines, June 23, 1906.) Detailed statistics of the purchase of machinery by the Rand Mines, Ltd., and subsidiary companies during the last fiscal year. 20c.

176—SOUTH AMERICA—Mining in the Guianas. O. G. Schultz. (Mg. Mag., July, 1906; 3 pp.) Gives statistics of gold production and general outline of mining conditions. 20c.

177—TRANSVAAL—Monthly Analysis of Gold Production in the Transvaal. April 1906. (Transvaal Chamber of Mines, Johannesburg; 5 pp.) Detailed statistical data.

IRON.

178—ORE HANDLING—Storage and Shipment of Iron Ore at Almeria. (Iron & Coal Tr. Rev., July 13, 1906.) Gives detailed description of this large plant, speaking of the loading stope and approach line, and describing the method of construction. Illustrated.

LEAD AND ZINC.

179—LEAD MINING in the Wisconsin-Iowa-Illinois District. (Eng. & Mg. Jl., July 14, 1906; 2½ pp.) Geology of the lead deposits near Galena, Ill., and in southwestern Wisconsin, together with account of present methods of mining employed. 20c.

180—UTAH—The Daly-Judge Mine. (Eng. & Mg. Jl., July 21, 1906.) Description of this important mine at Park City, Utah, the mining methods being treated with much detail. 20c.

181—UTAH—The Daly West Mine, Park City, Utah. (Eng. & Mg. Jl., July 7, 1906; 2½ pp.) Gives full details of the occurrences of the ores and methods of mining. 20c.

182—WISCONSIN—Zinc-Ore Mining in Wisconsin. (Eng. & Mg. Jl., June 30, 1906; 2½ pp.) An account of the methods of prospecting, shaft sinking, pumping and mining. Gives many details of cost. 20c.

LESSER MINERALS.

183—ANTIMONY AND WOLFRAM—Ueber die technische und ökonomische Ausbeutung von antimon- und Wolframerz in Portugal. E. Ackermann. (Chem. Zeit., July 11, 1906.) Mining, industrial and metallurgical notes respecting the production of antimony ore and wolfram ore in Portugal. 20c.

184—ASBESTOS—Carolina (South Africa) Asbestos. The Promise of a New Industry in the Transvaal. (So. Afr. Mines, June 11, 1906.) Names of operators and review of the work done in this district of South Africa. 20c.

185—ASPHALT—The Proximate Composition and Physical Structure of Trinidad Asphalt. C. Richardson. (Eng. Rec., June 30, 1906.) Deals with the chemical composition of various samples and speaks of the chemical action of the various elements on each other. Numerous experiments are described. 20c.

186—DIAMOND CUTTING—La Industria y el Comercio de Brilliantes en Amberes. (Bol. de la Soc. Nac. de Mineria, Jan. 31, 1906; 4½ pp.) An account of the diamond cutting industry at Antwerp, Belgium.

187—SULPHUR—Il giacimento solifero della Louisiana. (Stati Uniti d'America.) (Rassegna Mineraria, June 11, 1906; 5 pp.) Abstract of the important monograph of L. Baldacci, treating of the occurrence and methods of mining sulphur in Louisiana. 40c.

188—DIAMONDS—The Vaal River Diamond Diggings. E. G. Woodford. (So. Afr. Mines, June 9, 1906.) Reviews the recent development of this field. 20c.

189—MAGNETITE Deposits and Mining at Mineville, N. Y. J. H. Granbery. (Eng. & Mg. Jl., June 16 and 23, 1906; 4 pp.) Continuation of this series of articles on the geology of these magnetite deposits and methods of mining employed. 40c.

190—MANGANESE Industry of India. Ralph Stokes. (Mg. Wld., June 16, 1906.) Statistics and industrial conditions of manganese mining. 20c.

191—PHOSPHATE DEPOSITS—Composition de gisements de phosphate de chaux des Etats-Unis. P. Jumeau. (Annales de Chimie Anal., June 15, 1906; 4½ pp.) Continuation of article describing the phosphate deposits of the United States, giving many analyses. 40c.

192—PHOSPHATE ROCK—The Pacific Phosphate Company, Ltd. (Phosphate Industry, July 7, 1906.) Report of directors for 1905, giving statistics of the production of phosphate rock at Ocean Island. 40c.

193—PLASTER OF PARIS—The Manufacture of Plaster of Paris or Stucco. C. O. Bartlett. (Mines & Min., July, 1906.) Brief account of methods employed in the calcination of gypsum, and the manufacture of plaster of paris. 20c.

194—SALT—The Remington Salt Co. C. S. Palmer. (Eng. & Mg. Jl., June 30, 1906.) Technical data respecting the production of salt at Ithaca, N. Y. 20c.

195—TIN—Brookstead Tin Field, Tasmania. H. Grant. (Aus. Mg. Stand., June 6, 1906.) Describes the geology and present status of mining. 40c.

196—TIN—The Anchor Tin Mines. J. B. Lewis. (Eng. & Mg. Jl., June 30, 1906.) Describes the geology and the mining and milling methods, together with full data of costs. 20c.

197—TUNGSTEN — Ein Ausflug durch Boulder-County, Colorado. W. Tovote. (Oest. Zeit. f. Berg- u. Hüttenw., June 2, 1906.) Description of a tour through Boulder Co., Colo., referring especially to the tungsten mining industry. 40c.

ORE DRESSING.

198—CONCENTRATION of Silver-Lead Ores. V. F. S. Low. (Proc., Australasian Inst. Mg. Eng, Apr. 1906; 21 pp.) Description of the new mill of the Block Ten Company, Broken Hill, and methods of concentration.

199—FINELY-DIVIDED MATERIAL—Process for Separating Finely-Divided Material. F. E. Elmore. (U. S. Patent No. 826,411, July 17, 1906.) A process of separating certain constituents of finely-divided material, consisting in mixing the material with a liquid and a substance that has a selective affinity for some of the constituents, subjecting the mixture to a pressure below that of the atmosphere and collecting the particles floated, substantially as described. 20c.

200—PYRITES CONCENTRATION at Hermon, N. Y. (Eng. & Mg. Jl., June 23, 1906.) Description of a new concentrating mill. 20c.

201—UTAH—The Daly West Mill. (Eng. & Mg. Jl., July 14, 1906; 3 pp.) Illustrated description of the Daly West mill and methods employed, together with the apparatus invented by F. W. Sherman. 20c.

202—ZINC MILLING in Southwest Wisconsin. Geo. S. Brooks. (Eng. & Mg. Jl., June 16, 1906; 2½ pp.) Full details respecting the practice of lead and zinc milling in Wisconsin, together with full data as to the cost of plant, operation, etc. 20c.

METALLURGY.

203—CHEMICAL ENGINEERING—The Elements of Chemical Engineering. (Chem. Engr., May, 1906; 8 pp.) Continuation of article, discussing the construction of storage bins. 40c.

204—CONCRETE PILES—L'emploi des pieux en Beton pour les Fondations. (Le Génie Civil, June 16, 1906; 3½ pp.) Description of the several systems employed: Hennebique, Ferro-inclave, Dulac, Gow and Palmer, Raymond and Simplex. 40c.

205—ELECTROCHEMISTRY—The Niagara Falls Electrochemical and Metallurgical Industry. F. C. Perkins. (Mg. Wld., June 16, 1906.) Continuation of serial describing electric installations at Niagra Falls. 20c.

206—ORE ROASTING—Los procedimientos modernos para la calcinacion de minerales. J. Baxeres de Alzugaray. (Bol. de la Secretaria de, Fomento, Numero 11—II, June, 1906; 7 pp.) Metallurgical notes on the modern methods of ore roasting, with especial reference to the employment of mechanical furnaces.

207—SILICATES—Die Reaktions-geschwindigkeit in Silikatschmelzen, C. Doelter. (Zeit. f. Elektrochemie, June 15, 1906.) A physico-chemical study of the behavior of certain silicates at high temperatures. 20c.

208—WATER SOFTENING—The Mechanics of Water Softening. J. J. Royle. (Jl., Soc'y of Chem. Industry, May 31, 1906; 3 pp.) Treats on the subject of water softening from the standpoint of the mechanical engineer, endeavoring to carry out what is settled as the chemistry of the subject. 60c.

APPARATUS.

209 — ELECTRIC FURNACE — Its Evolution, Theory and Practice. A. Stansfield. (Can. Engr., July, 1906; 3 pp.) Treats especially of the efficiency of electric and other furnaces, and the relative cost of electrical and fuel heat. 20c.

210—ELECTRIC FURNACES—Vertical Arc Furnaces for the Laboratory. S. A. Tucker. (Electrochem. & Met. Ind., July, 1906.) Description of an experimental furnace which is essentially a Moissan furnace of graphite, arranged vertically, with the advantages of greater ease of construction, and bringing of the charge nearer to the source of heat. 40c.

211—GAS PRODUCER—Sauggaserzeuger für teerbildende Brennstoffe und für kleinstückigen Koksabfall. C. Diegel. (Stahl u. Eisen, July 1, 1906; 3½ pp.) Describes a particular type of suction gas producer suitable for the use of tarry fuels and fine coke dust. 60c.

212—HIGH TEMPERATURES—An Electrical Resistance Furnace for the Measurement of Higher Temperatures with the Optical Pyrometer. A. Lampen. (Jl. American Chem. Soc'y, July, 1906; 7 pp.) Experimental apparatus for the determination of high temperatures. 60c.

213—MECHANICAL ORE HANDLING—Zur Frage der Bewegung und Lagerung von Hüttenrohstoffen. M. Buhle. (Stahl u. Eisen, July 1, 1906; 6 pp.) Gives costs and other data on various types of ore handling machinery. Continuation of serial. 60c.

COPPER.

214 — ANACONDA COPPER MINING COMPANY—The Washoe Plant of the Anaconda Copper Mg. Co. in 1905. L. S. Austin. (Bi-monthly Bull., Amer. Inst. Mg. Engrs., July, 1906; 54½ pp.) An elaborate description of this important plant, and the methods employed there, illustrated by many drawings of furnaces and other apparatus; includes description of the sampling and concentrating works.

215—BRASS Melting and Mixing and Their Effect on the Quality of the Casting. E. S. Sperry. (Brass Wld., June, 1906; 8 pp.) A valuable practical article on metallurgy of brass making. Illustrated. 20c.

216—BRASS—The Microstructure of Brass. O. F. Hudson. (Jl., Soc'y of Chem. Industry, June 15, 1906; 2 pp.) Gives an explanation of the microscopic structure of the copper-zinc alloys with more than 50 per cent. copper.

217—COPPER EXTRACTION—Extraction of Copper from Pyrites' Cinders or Poor Ore, with Direct Production of Sulphate of Copper from the Lixiviation Liquids. Carl Milberg. (Mg. Jl., June 30, 1906.) Description of a hydro-metallurgical process employed in Italy. 20c.

218—COPPER REFINING—A Comparison of English and American Methods in the Refining and Manufacture of Copper. F. Platten. (Jl. Soc'y of Chem. Industry, May 31, 1906; 2½ pp.) Discussion of copper refining from the British standpoint. 60c.

219—METALLURGY OF COPPER—Some Features in the Metallurgy of Copper. T. Johnson, Jr., (Paper read before the Birmingham Metallurgical Soc'y, May 8, 1906.) Discussion of the effect of various impurities in refined copper, with notes on the annealing of copper. 40c.

220—PYRITE SMELTING—Ueber das Wesen des Pyrit-Schmelzverfahrens. R. Sticht. (Metallurgie, June 8, 1906; 7 pp.) Conclusion of the valuable paper, giving the views and practical experience of this eminent authority on the theory and practice of pyrite smelting. 60c.

FUELS.

221—ACETYLENE—The Thermal Constants of Acetylene. W. G. Mixter. (Amer. Jl. of Sci., July, 1906; 6 pp.) Laboratory experiments on the thermo-capacity and heat of combustion of acetylene. 60c.

222—COKE—Domestic Coke Manufacture. F. W. Parsons. (Eng. & Mg. Jl., June 16, 1906.) Describes a simple plant for the preparation of coke for sale as fuel for domestic purposes, with estimate of cost. 20c.

223—COKE MANUFACTURE and By-Product Recovery at Clay Cross. (Iron & Coal Tr. Rev., June 29, 1906.) Description of modern coke ovens that have recently been erected and are at present in operation. Several excellent illustrations accompany the article, showing the modern construction of the plant. 20c.

224—COKE OVEN FLUES—Improved Dampers for Coke Oven Flues. Wm. Archer. (Paper before the No. of Eng. Inst. of Mg. & Mechan. Engrs., June 9, 1906.) Contains a detailed description of a new form of coke oven damper, two different types and the material entering into their construction being described. The dampers have withstood temperatures varying from 1400° to 2100°F. 20c.

225—COKE OVENS—By-Product Coke and Huessener By-Product Coke Ovens. J. A. Roelofsen. (Paper before the June 14, 1906 meeting of the Instn. of Mg. Engrs.) Describes by-product coke ovens, especially the Huessener, and outlines the advantages to be derived from making coke in this way; refers especially to an installation at Clarence, County Durham, England. 20c.

226—FRANCE—Considérée comme source de matières premières sur la fabrication de matières, colorantes, de parfums, de médicaments, d'explosifs, etc. M. Haller. (Soc. Ind. du nord de la France, Séance solennelle du 28 Janvier, 1906; 16½ pp.) Gives statistics of coal production of France, regenerative furnaces, production of ammonium sulphate, coal tar, etc., with notes on the utilisation of the products of distillation.

227—LOW GRADE FUEL—Boiler Firing with Coal Containing a Large Percentage of Ash, Slate and Other Incombustible Matter. J. F. Hobart. (Elec. Wld., July 7, 1906.) Deals with the proper method of firing with low grade fuel, and shows how to obtain the best results with least expense, and how to obviate the grate difficulty. 20c.

GOLD AND SILVER.

228—BLACK SAND of the Pacific Coast. R. H. Richards. (Tech. Quarterly, June, 1906; 4 pp.) An account of the methods and results of black sand concentration in the experimental plant of the U. S. Geological Survey at Portland, Ore.

229—CYANIDE PROCESS — Description of the Ore Reduction Plant and Process of Reduction on the Great Boulder Proprietary Gold Mine. Robt. Allen. (Monthly Jl., Chamber of Mines of W. A., Apr. 30, 1906; 12 pp.) Description of the apparatus employed and the system of milling. 80c.

230—CYANIDE PROCESS—Ore Treatment Plant of the Associated Gold Mines of W. Australia. D. Clark. (Aus. Mg. Stand., May 23, 1906.) Description of the cyanide process at the Australia plant. 40c.

231—CYANIDING of Refractory Tailings on the Witwatersrand. W. H. C. Lovely. (Proc., Australasian Inst. of Mg. Engrs., Nov., 1905; 10 pp.) Description of methods found useful in treating a particular class of refractory tailings.

232—GOLD EXTRACTION—Ueber die Kosten der Goldextraktion einiger westaustralischer Minen. C. Göpner. (Metallurgie, June 8, 1906; 5 pp.) Gives cost of producing gold at certain West Australian mines. (Concluded). 60c.

233—MILLING PRACTICE at the North Star Mine, Nevada County, Cal. G. E. Alexander. (Mg. Rep., July 19, 1906; 2½ pp.) Illustrated description of the 40-stamp mill and milling methods at this famous mine. 20c.

234—ORE TREATMENT PLANT—The Stamp Mill and Cyanide Plant of the Combination Mines Company at Goldfield, Nevada. M. R. Lamb. (Eng. & Mg. Jl., June 30, 1906; 2 pp.) Description of a new plant at Goldfield, methods employed and technical results. 20c.

235—PERU—Yacimientos minerales de Cajabamba. F. M. Santolalla. (Boletin de la Soc. Nac. de Mineria, Jan. 31 and Feb. 28, 1906; 17 pp.) Continuation of serial, describing methods of amalgamation and lixiviation of silver ore employed at Sayapullo, Prov. of Cajabamba, Peru.

236 — PRECIOUS-METAL-BEARING MATERIAL—Process of Treating. C. W. Merrill. (U. S. Patent No. 825,920, July 17, 1906.) The improvement in treating a precious-metal-bearing material with cyanogen-bearing solution after preliminary contact with such solution, consisting in removing the cyanogen-bearing solutions from the interstitial spaces of the crushed material, applying a solution of alkali-metal or alkaline-earth-metal hypochlorite to said material and subsequently applying a cyanogen-bearing solution to said material. 20c.

237—SILVER AND SILVER SULPHIDE—Silber und Schwefelsilber. K. Friedrich and A. Leroux. (Metallurgie, June 8, 1906; 13 pp.) A thermometric and micrographic study of silver and silver-sulphide alloys made at the Royal School of Mines at Freiberg. 60c.

238—STAMP MILLING—Notes on Stamp Mill Practice. C. DeKalb. (Paper read at the Mar., 1906 meeting of the Can. Mg. Inst.) A very valuable paper describing in detail the foundations, mortar liners, shoes and dies, screens and amalgamating plates to be used in stamp mill practice, together with much other practical data on gold milling. 40c.

239—TUBE MILL PRACTICE—W. R. Dowling. (Jl. Chem. & Mg. Soc'y of So. Africa, Apr, 1906; 6½ pp.) Gives points of practical interest for those engaged in tube mill work, based on data gained at the Robinson Deep mine, Transvaal. 60c.

240—TUBE MILLS on Eckstein Mines. (So. Afr. Mines, May, 26, 1906.) Gives results of tube mill operation on the Rand. 20c.

IRON AND STEEL.

241—BASIC STEEL—Vorgänge beim Stahlschmelzen. A. Ruhfus. (Stahl u. Eisen, July 1, 1906; 3 pp.) Notes on the operation of basic steel furnaces. 60c.

242—BLAST FURNACE—A Simple Rotary Distributor for Blast Furnace Charges. D. Baker. (Bi-monthly Bull., Amer. Inst. Mg. Engs., July, 1906; 4½ pp.) Describes a new form of rotary distributor, which may be applied to any form of double-bell charger, retaining the perfect gas seal, which is obtained by the Brown distributor.

243—BLAST FURNACE—Metallurgical Calculations: The Heat Balance Sheet of the Blast Furnace. J. W. Richards. (Electrochem. & Met. Ind., July 1906; 3½ pp.) An elaboration of the heat balance sheet, first constructed by Sir Lowthian Bell, extended to more general conclusions. 40c.

244—BLAST FURNACE—The Gas Producer as an Auxiliary in Iron Blast Furnace Practice. R. H. Lee. (Bi-monthly Bull., Amer. Inst. Mg. Engrs., July 1906; 4½ pp.) Suggestions as to the use of producer gas in in connection with hot blast stoves and steam boilers, it being argued that gas firing would have important advantages over coal firing.

245—BLAST FURNACE—The Northern Iron Company's Blast Furnace. J. H. Granbery. (Eng. & Mg. Jl., July 21, 1906; 4 pp.) A detailed account, illustrated by photographs and working drawings, of the present blast furnace plant at Port Henry, N. Y., together with results of recent practice. 20c.

246—BLAST FURNACE GAS—Gas Cleaner for Blast Furnace Gas. P. Meehan, (Ind. Wld., July 7, 1906; 4 pp.) Description of a recently patented apparatus for cleaning blast furnace gas, the object of which is not to reduce the temperature. 20c.

247—BLAST FURNACE PLANT of the Federal Furnace Company. (Iron Age, July 19, 1906: 3½ pp.) Gives an account, with plans and drawings, of a blast furnace plant, particularly designed to meet the requirements of the merchant iron trade. 20c.

248—BLAST FURNACE SLAG—The Manufacture of Cement from Blast Furnace Slag. (Iron Tr. Rev., June 28, 1906; 3½ pp.) An account of the new plant built by the Struthers Furnace Co. at Struthers, O., which includes the latest improvements in cement manufacture. 20c.

249—BLAST FURNACE SLAGS—O. Boudouard. (Revue générale Chimie, 1906, p. 137.) Discussion of the industrial usefulness of blast furnace slags, it being estimated that the metallurgical operators of the world now make a yearly production of 100,000,000 tons of slag.

250—CORROSION OF IRON AND STEEL—The Relative Corrosion of Wrought Iron and Steel. H. M. Howe. (Eng. News, June 28, 1906.) Critical discussion of the common opinion that steel corrodes faster than wrought iron. 20c.

251—DRY AIR BLAST—Zur Frage der Windtrocknung. B. Osann. (Stahl u. Eisen, July 1, 1906; 5 pp.) Further observations on the Gayley process. 60c.

252—ELECTRIC FURNACE for Heating Crucibles. O. P. Watts. (Electrochem. & Met. Ind., July 1906.) Illustrated description of a furnace employed in an investiga-

tion upon the production and properties of electrolytic iron and iron alloys, now being conducted at the University of Wisconsin. 40c.

253—ELECTRIC FURNACE—Methods of Iron and Steel Production. J. B. C. Kershaw. (Iron Tr. Rev., Jan. 28, 1906.) The first article of a series on electric furnace methods; is mainly a repetition or condensation of the first part of Dr. Eugene Haanel's report on electric smelting made to the Canadian government. 20c.

254—ELECTRIC FURNACE—Some Laboratory Experiments with the Electric Furnace. J. W. Evans. (Can. Mg. Rev., June, 1906; 3½ pp.) Account of experiments on the smelting of iron ores high in sulphur and titanium, also of black sands. 40c.

255 — ELECTRIC SMELTING — Elektrothermie des Eisens und Stahls. C. A. Keller. (Elektrochem. Zeit., July, 1906.) Continuation of important paper, giving experimental and practical results of the author, who is well-known in this field. 60c.

256—FORGING and Stamping in Iron and Steel. J. C. Bunby. (Paper read before the Birmingham Metallurgical Soc'y, May 8, 1906.) Description of the methods of forging, welding and hot stamping of iron and steel, together with discussion of the properties of metal adaptable to these purposes. 20c.

257—FOUNDRY—Comparative Designs and Working of Air Furnaces. R. H. West. (Trans. Amer. Fdymen's Assn., June 1906 meeting; 10 pp.) This article is a supplement to a series by L. G. Blunt in previous issues of the *Foundry*. The author gives some data obtained by him in actual practice with camel back and other types of air furnaces.

258—FOUNDRY—Die Bedeutung der Chemie für die Eisengiesserei. M. Orthly. (Metallurgie, July 8, 1906; 10 pp.) An elaborate discussion of the importance of chemical knowledge in iron foundry practice, the paper being accompanied by tables of many analyses. 60c.

259—FOUNDRY—Kinnear Steel Roller-Shutter Doors for Foundries. (Can. Engr., July, 1906; 2 pp.) Gives details of an improved door for core ovens. 20c.

260—FOUNDRY—Pattern Mounting on the Molding Machine. F. W. Hall. (Amer. Mach., July 12, 1906; 3½ pp.) Description of the various devices used and action when pattern is drawn. 20c.

261—FOUNDRY—Specifications for Foundry Pig Irons. W. B. Parker. (Iron & Coal Tr. Rev., June 29, 1906; 3½ pp.) Gives the composition and grading of the principal classes of the pig irons already in use, and also the composition and grading which will be most suitable for the largest number of purposes. The results of researches by experts are also given. 40c.

262—HARDENING OF STEEL—Die Molekularen Vorgänge beim Härten. O. A. Böhler. (Oest. Zeit. f. Berg- u. Hüttenw., June 30, 1906; 2½ pp.) Discussion of the molecular changes which take place in the hardening of steel. 40c.

263—INDIA—Iron and Steel Manufacture in India. The Tata Iron and Steel Co. (Iron Age, July 12, 1906; 4 pp.) An account of the plans for the manufacture of iron and steel in the Mourbhanj and Raipur districts in India, giving maps of the iron ore deposits in those districts. The plan was started by the late J. N. Tata several years ago, and has been urged upon the attention of English iron masters rather persistently for a number of years. 20c.

264—IRON-CARBON ALLOYS—Ueber das Gleichgewicht und die Erstarrungsstrukturen des Systems Eisen-Kohlenstoff. C. Benedicks. (Metallurgie, July 8, 1906; 26 pp.) Continuation of an elaborate paper on iron-carbon alloys from the physico-chemical and metallographical standpoint, illustrated by many micro-photographs. 60c.

265—IRON AND STEEL—Ein neues Arbeitsverfahren im Stahlwerksbetriebe. K. Brisker. (Oest. Zeit. f. Berg- u. Hüttenw., June 23, 1906; 2 pp.) Describes a new method introduced by G. Reitboeck at Kladno, Austria. 40c.

266—METALLOGRAPHY—Fortschritte in der Metallographie der Eisen-Kohlenstoff-Legierungen. E. Goecke. (Zeit. f. Elektrochemie, June 8, 1906; 4 pp.) Summary of the latest knowledge and opinions in the metallography of iron and steel. 40c.

267—ORE ROASTING—A Novel Furnace for Roasting Fine Ore. A. Gradenwitz. (Iron Tr. Rev., July 19, 1906.) Illustrated description of a new type of furnace recently designed by G. O. Petersson and erected at Dalsbruk, Finland. The inventor suggests the possibility of utilizing iron ores containing titanium for the production of cast iron, by means of roasting in this furnace. 20c.

268—OVERSTRAINED STEEL — Effect of Low Temperature on the Recovery of Steel from Overstrain. E. J. McCaustland. (Bi-monthly Bull. Amer. Inst. Mg. Engrs., July, 1906; 6½ pp.) Supplementary diagrammatic charts, showing the results of heat treatment of certain specimens referred to in the May number of the *Bi-monthly Bulletin*.

269—PIG IRON—The Influence of Different Ore Mixtures on the Resultant Pig Iron from the Standpoint of the Foundry. W. A. Barrows. (Trans., Amer. Fdymen's Assn., June, 1906 meeting; 4 pp.) Gives an account of a number of experiments in mixing pig iron for various purposes. It refers particularly to the influence of the constituent ores used in the blast furnace on the pig iron produced.

270—PIG IRON—Twenty Years' Improvement in the Quality of Pig Iron. E. H. Williams, and E. R. Sanborn. (Trans., Amer. Fdymen's Assn., June, 1906 meeting; 3 pp.) Gives a summarized account of the old methods of grading iron by fracture and a comparison with modern methods of selling and grading iron by analysis.

271—PIPE FOUNDING—H. A. Croxton. (Trans., Amer. Fdymen's Assn., June, 1906 meeting; 3½ pp.) A description of the methods and machines used in making a cast iron pipe which is now an important branch foundry work. Pipe manufacture requires care in the mixing and grading of iron, and also in the molding, which is largely done by machinery.

272—STEEL INDUSTRY—The Growth of the Steel Industry. Harold Baxter. (Mg. Rep., July 19, 1906.) General notes on the recent industrial progress in this industry. 20c.

273—STEEL PLANT—U. S. Steel Corporation's Great Plant at Gary, Ind. (Iron Tr. Rev., June 21, 1906; 3 pp.) Gives an account of the plans completed for the large blast furnace and steel plant at Gary, Ind., the construction of which has just been begun by the Indiana Steel Co., a subordinate company of the U. S. Steel Corporation. The article includes plans showing the general arrangement of the works which are intended to include the latest practice and to dispense as far as possible with hand labor. The plant will include blast furnaces, open-hearth steel furnaces and rolling mills. 20c.

LEAD AND ZINC.

274—CADMIUM OXIDE—Versuche über das Verhalten von Cadmiumoxyd bei höheren Temperaturen. F. O. Doeltz and C. A. Graumann. (Metallurgie, June 8, 1906; 3 pp.) Shows losses of weight by heating in current of air at varying temperatures and for different durations of time. 60c.

275—FLUE DUST—Zur Bildung von Flugstaub und Ofenbruch im Bleihüttenbetriebe. F. O. Doeltz and C. A. Graumann. (Metallurgie, July 8, 1906.) Discussion of the form in which lead is lost by volatilization in metallurgical practice. 40c.

276—LEAD BULLION—Desilverizing Lead Bullion. August Raht. (U. S. Patent No. 826,114, July 17, 1906.) The treating of lead bullion while in a molten state consisting in adding zinc thereto and then adding sal ammoniac for the purpose of causing a more ready and complete separation of the lead therefrom. 20c.

277—LIME ROASTING—The Savelsberg Process. (Eng. & Mg. Jl., June 16, 1906.) Brief note as to this new process for roasting lead ore, illustrated by a series of instructive photographs. 20c.

278—LUNGWITZ PROCESS of Zinc Smelting. F. W. Gordon, (Eng. & Mg. Jl., July 14, 1906; 3 pp.) Further arguments, from a physico-chemical standpoint, on the smelting of zinc ore in the blast furnace, together with illustration of the furnace installed at Warren, N. H. 20c.

279—SLAGS—A New Apparatus to Determine the Melting Points of Slags. W. McA. Johnson. (Electrochem. & Met. Ind., July, 1906.) Description of apparatus employed in the experimental work in connection with the Lungwitz zinc smelting process at Warren, N. H. 40c.

280—ZINC BLENDE—Zur Distillation der gerösteten Zinkblende und zum Brennen des Galmeis. F. O. Doeltz and C. A. Graumann. (Metallurgie, July 8, 1906.) Results of experimental investigations as to the distillation of roasted blende, and the calcination of calamine. 40c.

281—ZINC BLENDE—Zur Frage der Fluchtigkeit der Zinkblende. F. O. Doeltz and C. A. Graumann. (Metallurgie, July 8, 1906.) Results of experimental investigations as to the volatility of zinc blende at high temperature. 40c.

282—ZINC BLENDE—Zur Zerlegung und Bildung von Zinksulfat beim Rösten der Zinkblende. F. O. Doeltz and C. A. Graumann. (Metallurgie, July 8, 1906.) Results of laboratory investigations upon the formation of zinc sulphate in the roasting of blende, and its behavior, the author inclining to the view, previously expressed by Hofman, that the formation of basic sulphates does not occur. 40c.

283—ZINC PRODUCTION—The Imbert Process. E. G. Spilsbury. (Mg. & Sci. Press, June 30, 1906.) Metallurgical and technical data of a new process for treating zinc-lead sulphide ore, now being tested in France. 20c.

LESSER METALS.

284—ALLOYS of Antimony and Tin. F. E. Gallagher. (Jl. of Phys. Chem., Vol. X., 1906; pp. 93-98.) Results of a microscopical examination of these alloys, the conclusion being that they do not form any chemical compound, but give solid solutions.

285—AURIFEROUS ANTIMONIAL ORE—Methods of Treatment. A. Selwyn-Brown. (Aus. Mg. Stand., May 30, 1906.) Refers to new methods for the treatment of this class of ore. 20c.

286—CARBORUNDUM — The Measurement of Temperature in the Formation of Carborundum. S. A. Tucker and A. Lampen. (Jl. Amer. Chem. Soc'y, July, 1906; 4½ pp) An experimental chemical investigation showing the formation point of carborundum to be 1950° C., and its decomposition point into graphite and silicon 2220°C. 60c.

287—NICKEL—Versuche zum Verblasen von Nickelstein auf Nickel mittels saüerstoffreichen Windes. R. Hesse. Metallurgie, June 8, 1906; 6 pp.) Describes an electric furnace for converting nickel matte into metallic nickel. 60c.

INDUSTRIAL CHEMISTRY.

288—ARSENIC ORES—Mode d'utilisation des sulfures bruts d'arsenic. F. Howles. (Revue des Produits Chimiques, July 1, 1906.) A leaching process for the treatment of antimony ore. 40c.

289 — ATMOSPHERIC NITROGEN — Ueber die direkte Verwertung des Stickstoffes der Atmosphäre für Gewinnung von Düngemitteln und anderen chemischen Produkten. A. Frank. (Paper before the International Congress for Applied Chemistry, Rome, 1906; 16 pp.) Outline of the processes heretofore employed for utilizing the nitrogen of the air.

290—BASIC SLAG—Sur la composition des scories Thomas. A. Grégoire. (Rev. de Chimie Industrielle, June, 1906; 3 pp.) Treats of the condition in which the phosphorus content of Thomas slag exists and its applicability to agriculture. 40c.

291—CHEMICAL PLANT of the Cleveland Cliffs Iron Co. (Mg. Wld., July 7, 1906). Describes the manufacture of wood alcohol and accessory products at North Marquette, Mich. 20c.

292—CHIMNEY GASES—The Industrial Application of Chimney Gases. C. Ellis. (Chem. Engr., June, 1906; 10 pp.) Describes the Eldred process as applied to the calcination of lime, burning of portland cement clinker, and brick burning. 40c.

293 — ELECTROCHEMISTRY — Die Elektrochemie im Jahre 1905. M. Krüger, (Elektrochem. Zeit., July, 1906.) Continuation of review of progress, this instalment referring especially to the alkali industry. 60c.

294—FIXATION OF NITROGEN—Production of Nitrogen Oxides from Atmospheric Air. F. Foerster. (Electrochem. & Met. Ind., July, 1906.) Paper read before the German Bunsen Soc'y on May 21, 1906, being a theoretical and technological discussion of the problem of the fixation of atmospheric nitrogen. 40c.

295—FIXATION OF NITROGEN—The Electrochemical Problem of the Fixation of Nitrogen. P. A. Guye. (Jl., Soc'y of Chem. Ind., June 30, 1906; 11 pp.) An elaborate and valuable discussion of the problem of extracting nitrogen from the atmosphere, and its utilisation for the manufacture of nitrates, together with numerous estimates of cost.

296—SODA—Aus der Praxis der Ammoniaksoda-Industrie. K. W. Kurisch. (Chem. Zeit., July 11, 1906.) First instalment of a valuable article on the manufacture of soda by the ammonia process, this part dealing especially with lime burning furnaces, in connection with which a bibliography of that branch of the subject is given. 20c.

297—STRONTIUM—Zur Geschichte der Strontianentzuckerung. H. Ost. (Zeit. f. angewandte Chemie, June 29, 1906.) On the substitution of strontium for the more usual barium carbonate in sugar manufacture. 40c.

298—SULPHURIC ACID—Das Verhalten des Selens im Schwefelsaurebetriebe. S. Littmann. (Zeit. f. angewandte Chemie, June 15, 1906; 8½ pp.) Discusses the behavior of selenium in sulphuric acid manufacture.

299—SULPHURIC ACID — Füllmaterial für Schwefelsäuretürme. G. Lunge. (Zeit. f. angewandte Chemie, June 22, 1906.) Refers to packing material for sulphuric acid towers.

300—SULPHURIC ACID — Mechanische Röstöfen beim Bleikammerprozess. E. Hartmann and F. Benker. (Zeit. f. angewandte Chemie, June 22 and 29, 1906; 7 pp.) Conclusion of article giving a description of the various types of mechanical roasters suitable for pyrite burning, discussing especially the MacDougall type.

301 — SULPHURIC ACID — Praktische Beiträge zur Bleikammertheorie. S. Littmann. (Zeit. f. angwandte Chemie, June 29, 1906; 11 pp.) Careful observations of the running of lead chambers under various circumstances. 40c.

ANALYTICAL CHEMISTRY.

302—ARSENIC FROM ANTIMONY—Séparation de l'arsenic dans l'antimoine. H. L. Herrenschmidt. (Rev. des Produits chimiques, July 1, 1906.) A method of separating arsenic from antimony either as oxide or in solution. 20c.

303—CARBON IN IRON AND STEEL—The Determination of Carbon in Iron and Steel by Direct Ignition with Red Lead. C. M. Johnson. (Jl. Amer. Chem. Soc'y, July, 1906; 14½ pp.) A new method which has been used successfully for routine combustion analysis. 60c.

304—CARBON IN IRON AND STEEL—Volumetric Method for the Estimation of Carbon in Iron and Steel with the Use of Barium Hydroxide J. A. Aupperle. (Jl., Amer. Chem. Soc'y, July, 1906; 4 pp.) A new method which has been found to compare favorably with results obtained by gravimetric methods, with the advantage of being more rapid. 60c.

305—CARBONIC ACID DETERMINATION—Schelbler's Apparatus for the Determination of Carbonic Acid in Carbonates; an Improved Construction and Use for Accurate Analysis. S. H. Collins. (Jl. of the Soc'y of Chem. Industry. June 15, 1906; 4 pp.) Description of a simple and rapid gasometric method. 60c.

306—ELECTROCHEMICAL ANALYSIS A Simple Form of Rotating Electrode for Electrochemical Analysis. F. M. Perkin. (Faraday Soc'y Trans., June 12, 1906, advance proof.) Two concentric coils of platinum-iridium wire of 1 mm. thickness serve as electrodes, the central cathode being rotated. Nickel wire cathodes have also been used with some success.

307 — ELECTROLYTIC DEPOSITION OF ZINC Using Rotating Electrodes. T. S. Price and G. H. B. Judge. (Paper before the Faraday Soc'y, June 12, 1906, advance proof.) Results of an investigation as to the deposition of zinc from solutions of the sulphate, making use of a rotating cathode, with description of a method for the accurate determination of zinc electrolytically. 40c.

308—FLUORSPAR — The Analysis of Fluorspar. W. G. Waring. (Chem. Engr., May, 1906.) Gives a convenient analytical method. 40c.

309—HYDROGEN SULPHIDE GENERATOR—A Modified Hydrogen Sulphide Generator. A. W. Browne and M. F. Mehling. (Jl. Amer. Chem. Soc'y, July, 1906; 8 pp.) An improved convenient apparatus for use in the chemical laboratory. 60c.

310—IRON DETERMINATION—Fehlerquellen bei der titrimetrischen Bestimmung des Eisens mit Permanganat. H. Kinder. (Chemiker-Zeitung, June 27, 1906.) Discusses the weak points in the several methods of iron determination by treating with permanganate.

311—MANGANESE—A Quick Method of Estimating Manganese. J. Darroch and C. A. Meiklejohn. (Eng. & Mg. Jl., July 21, 1906.) Detailed account of a new, quick method, which is not only accurate but has the advantages of avoiding separation of the iron as basic acetate, and requiring no filtering, all operations being conducted in the same beaker. 20c.

312—RADIO-ACTIVE MINERALS—The Relative Proportion of Radium and Uranium in Radio-active Minerals. E. Rutherford and B. B. Boltwood. (Amer. Jl. of Sci., July, 1906; 2½ pp.) Description of laboratory experiments on uraninite from North Carolina. 60c.

313—RADIUM—The Measurement of Radium in Minerals by the "Gamma"-Radiation. A. S. Eve. (Amer. Jl. of Sci., July, 1906; 3½ pp.) Description of a new method of determining the amount of radium in radio-active minerals. 60c.

314—SILICA IN IRON ORES—The Determination of Silica in Iron Ores Containing Alumina. G. Dean.(Jl. Amer. Chem. Soc'y, July, 1906.) A rapid method based on the fact that if the insoluble residue left on the treatment of iron ore with acids be ignited for a short time, the alumina which it contains is converted into a form soluble in concentrated hydrochloric acid. 60c.

315 — SULPHUR DETERMINATION — The Determination of Sulphur in Pyrites. F. Raschig. (Chem. Engr., June, 1906; 6½ pp.) Describes the benzidine sulphate method for the determination of sulphur, and replies to criticisms as to its accuracy. 40c.

316—SULPHUR IN IRON—Zur Bestimmung des Schwefels im Eisen mit besonderer Berücksichtigung des maassanalytischen Verfahrens. C. Reinhardt. (Stahl u. Eisen, July 1, 1906; 6 pp.) Describes new apparatus and methods for determination of sulphur in iron, obviating some of the inaccuracies of the barium-precipitation methods. 60c.

317—TIN—A Volumetric Method for Tin. J. Darroch and C. A. Meiklejohn. (Eng. & Mg. Jl., June 23, 1906.) A quick and accurate volumetric method applicable to all ores of the metal. 20c.

GENERAL MACHINERY AND APPARATUS.

318—BELT CONVEYOR—R. M. Catlin. (U. S. Patent No. 826,312, July 17, 1906). In a conveyor, the combination of an endless conveyor-belt sustained by suspension at its edges, and an endless driving device and means for automatically connecting said endless driving device to the edges of the conveyor-belt, substantially as described. 20c.

319—BELT CONVEYORS—Picking Belts. E. H. Messiter. (Eng. & Mg. Jl., June 16, 1906.) Application of the belt conveyor for ore sorting purposes, with data as to capacity, etc. 20c.

320 — DYNAMO-ELECTRIC MACHINERY, Repairing of. N. G. Meade. (Power, July, 1906; 3 pp.) Illustrated description of various devices and methods for use in repairing dynamo-electric machinery. 20c.

321—ELECTRIC POWER—Efficiency of Steam Plant. W. A. Vignoles. (Electrician, July 6, 1906; 5 pp.) Gives efficiency curves and tables, together with a discussion of the paper which was read at the 11th convention of the Incorporated Municipal Electrical Assn., London, June 22, 1906. 40c.

322—ELECTRIC POWER—New Turbine Plant for Railway Lighting and Power Service. (Engr., July 16, 1906; 3½ pp.) Illustrated description of the power plant of the City of Portsmouth, O. 20c.

323—ENGINE ROOM CHEMISTRY—Animal and Vegetable Oils. A. H. Gill. (Power, July, 1906.) Continuation of serial, dealing in this issue with the various animal and vegetable oils used as lubricants, giving their source, properties, uses and adulterants. 20c.

324 — EXHAUST STEAM — The Ratean Exhaust-Steam Regeneration and Utilisation Plant. (Engineering, June 29, 1906; 4 pp.) Describes the principle on which this system operates, showing the results of tests on low-pressure turbine plant.

325—GAS ENGINES—Design, Construction and Application of Large Gas Engines in Europe. F. E. Junge. (Power, July, 1906; 4 pp.) Continuation of serial, containing in this issue a description of the Reichenbach engine, illustrated by several figures showing the details of the engine. 20c.

326—GAS ENGINES—Rational Methods of Gas Engine Powering. S. S. Moss. (Power, July, 1906; 2½ pp.) Contains valuable tables, formulas, etc. relating to the subject, deduced from practice. 20c.

327—GAS PRODUCER—The Cone Gas Producer. W. H. Cone. (Eng. & Mg. Jl., July 14, 1906.) Illustrated description of a new gas producer, especially adapted to gasefying soft coal and utilising the heating value of tar. 20c.

328—GAS PRODUCER PLANTS and Gas Engines. C. A. Smith. (Eng. Times, June 21, 28 and July 5, 1906; 8½ pp.) Enumerates the fundamental principles in the composition, manufacture, efficiency and economy, the transmission, and the running of engines by producer gas. 60c.

329—GAS PRODUCER TESTS—The R. A. S. Trials of Suction Gas Plants. (Engineering, June 15, 1906; 6½ pp.) Description of the various suction gas plants submitted at Derby, England, for the trials of the Royal Agricultural Society, preceded by notes on the development of this form of power. 40c.

330—HYDRO-ELECTRIC PLANT at Albany, Ga. R. W. Hutchinson, Jr. (Elec. Wld., June 16, 1906.) Illustrated description of the hydro-electric plant of the Albany Power & Mfg. Co., located on the Muckafoonee river, about 1½ miles north of the city of Albany. 20c.

331—HYDRO-ELECTRIC PLANT of the Baker Light and Power Company, Baker City, Ore. (Elec. Rev., July 7, 1906; 3 pp.) Illustrated description of the plant, which gets power from a stream several miles away. The method of carrying water in flume and the transmission line which distributes power throughout the entire territory served, are also described. 20c.

332—HYDRO-ELECTRIC POWER—Modern European Hydro-Electric Plants. F. C. Perkins. (Mg. Wld., July 14, 1906.) Description of hydro-electric plants in France, Italy, Switzerland and Germany. 20c.

333 — HYDRO-ELECTRIC POWER — Winnipeg, Manitoba, 60,000-Volt Hydro-Electric Plant. V. D. Moody. (Elec. Wld., June 23, 1906; 4½ pp.) Illustrated description of the equipment of the plant. 20c.

334 — HYDRO-ELECTRIC POWER PLANT of the Nevada Power Mining and Milling Co. J. D. Galloway. (Eng. Rec. June 30, 1906; 2½ pp.) Illustrated description of the above plant which is situated in Inyo Co., Cal. 20c.

335—LUBRICATION—Oiling Systems for Electric Engines. W. H. Wakeman. (Elec. Wld., July 7, 1906.) Description of several different oiling systems for electric engines taken from practice. Figures descriptive of each system are attached. 20c.

336—LUBRICATION—The Gravity Sight-Feed Lubricator. P. D. Phillips. (Power, July, 1906.) Description of the apparatus, illustrated by a marked section of the lubricator. 20c.

337—SMOKE ABATEMENT—The Problem of Smoke Abatement. W. H. Bryan. (Amer. Mach., July 12, 1906; 2½ pp.) Suggestions of methods whereby the smoke nuisance may be partly eliminated. 20c.

338—STEAM ENGINES—Remarkable Efficiencies in Small Engines Using Superheated Steam. R. E. Mathot. (Power, July, 1906.) Contains valuable tables and diagrams. Also treats compound condensing engines. 20c.

339—STEAM TURBINE UNIT—Tests of a 500-kw. Steam Turbine Unit. (Engineering, July 6, 1906.) Description of tests of a steam turbine of English construction, with table of results obtained. Illustrated. 40c.

340 — SUCTION GAS PRODUCER PLANT at Wichita, Kan. (Engr., July 16, 1906; 3 pp.) Description of a Pintsch gas producer plant in connection with a 75-h.p. Olds gas engine. 20c.

341 — TRAMWAY SYSTEMS — Power Supply to Tramway Systems. S. J. Watson. (Electrician, July 6, 1906; 2½ pp.) Gives curves together with discussion on the types and capacities of plants for light and heavy tramway work; also gives costs, supply charges and fixed charges. 40c.

MATERIALS OF CONSTRUCTION.

342—FERRO-CONCRETE— H. Kestner. (Jl., Transvaal Inst. of Mechan. Engrs., May 1906; 13 pp.) Describes the methods employed in the use of reinforced concrete, with certain precautions to be observed.

343—PROTECTIVE COATINGS FOR STEEL—A. B. Harrison. (Paper before the American Soc'y for Testing Materials, June 21, 1906.) Notes of experience with the various protective coatings for steel work, including oil paints, varnishes and carbon coatings. 20c.

344—REINFORCED CONCRETE — The Comparative Advantages of Hard and Soft Steel for Reinforcing Concrete. D. B. Luten. (Eng. News, July 19, 1906.) The author's summary is confined to a statement of the fact that there is no more advantage to be derived from using hard than soft steel, and that it has no reference to its desirability for this or other engineering purposes. 20c.

345—SAND-LIME BRICK — New Sand-Lime Brick Plant at South River, N. J. (Eng. Rec., July 14, 1906.) Description of the plant which has just been built by the N. Y. Granite Brick Co., which is said to be the largest plant of its kind in existence. The methods of maunfacture are also described. 20c.

346—TESTING MATERIALS—The Sand Blast for Testing Materials. H. Burchartz. (Eng. Rec., July 14, 1906.) Description of the apparatus used for abrasion tests in the Royal Laboratory for Testing Materials at Gross-Lichterfelde, Germany, and results obtained. Illustrated. 20c.

347—TESTING OF METALS—Repeated Impact Testing Machine at the National Physical Laboratory. T. E. Stanton. (Engineering, July 13, 1906.) Description of a machine designed to assist in research on the action of metals under the influence of impact, with notes of results obtained by its use. 40c.